5.7 HABITAT RESTORATION: PRESENT POTENTIAL AND LIMITATIONS

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Introduction

As explained in detail and shown graphically in the streamway and groundwater components of this report, the physical environment that supports the riparian habitats of the Cache Creek study area has changed substantially over time, with the most dramatic changes occurring over the last 100 years. Some physical environmental changes continue to proceed in ways that substantially alter the present and potential future character of riparian habitat within the study area.

The enhancement and/or expansion of riparian habitat within the study area depends upon the creation and maintenance of a channel morphology and hydrology that are conducive to the development of desired habitat types or mosaics. Specifically, frequent flooding is necessary to create seasonal saturation and to deposit fine-grained sediments, and near-surface ground water is necessary to sustain woody vegetation through dry seasons and years. Wherever surface flow is not perennial, the duration of the seasonal flow is very important in determining the character of the vegetation that can develop. Active habitat restoration efforts, such as removal of undesired weedy species or planting of desired native species, are only successful in the context of other actions that will maintain the proper soils and hydrologic regimes. Thus, achievement of habitat goals is realized primarily by improving the physical character of the streamway, and secondarily by specific vegetation-directed actions. The limitations imposed on re-establishment of extensive riparian habitat include narrowing of the floodway, diversion of surface flows, and surface disturbance due to aggregate mining. In general, the recommendations for establishing a wider channel morphology more similar to historical conditions and modifying aggregate extraction operations significantly would provide opportunities for establishment of riparian habitat (Recommendations 1, 2, 3, 6, and 7 above). Changes in flow-duration characteristics described in Recommendation 9 may also benefit riparian communities, although additional summertime flow may be required to support vegetation (see Chapter 5).

Present Riparian Habitat Limitations

Four primary circumstances constitute the main constraints upon the amount and nature of riparian habitat that can exist within the study area: narrowing of the floodway, diversion of surface flows, lowering of the groundwater table, and surface disturbance resulting from aggregate mining.

Floodway Narrowing

The most obvious respect in which the narrowing of the Cache Creek channel and associated floodway affects riparian vegetation is in reducing the area that is available for habitat. However, an equally important effect is the acceleration of flow velocities that results from the physical constraint upon the flowing water (see Sections 3.3 and 3.6). Generally higher flow velocities transport and deposit larger sediment particles (for example, gravels rather than fine sands), which are much less suitable for the establishment and succession of the diverse native plant communities that previously covered most of the area of the lower Cache Creek riparian system. In many portions of the study area, invasion by tamarisk appears to be correlated with reaches of especially coarse grained substrates. Specifically, the Capay subreach has narrowed substantially in the period from 1937 to 1994, and this subreach is the most striking example of an area that could support generally high quality woody riparian habitat, but is being widely invaded by tamarisk and giant reed.

Hydrologic modeling suggests that substantial improvements of the undesirable erosion and sediment transport instabilities of the present system could be realized by smoothing the longitudinal channel boundary, as shown in Figure 6-1. Over most of the study reaches, this would not require large scale overall widening of the present channel.

Surface Water

Diversion of surface water is often presented and analyzed in terms of total yield of a watershed and total amount of water that is subject to water rights. However, as is recognized by the seasonal limitations that apply to most water rights, the season during which that water may be diverted is critical. The season during which diversion for agricultural use is most important (spring and early summer) is also the season during which water is most important for riparian vegetation. For this reason, the diversion of most or all surface water during the growing season has a profound effect on the present conditions and potential future restoration of habitat. This is exemplified by the fact that the highest quality riparian habitats in the study area occur in gaining reaches, where some surface flow is supported by groundwater mounding on near-surface geologic formations.

With respect to riparian habitat, it is necessary to consider not only the total quantities of water or even merely the season during which surface flow is or is not present. It is also necessary to consider the duration of different depths of flow. For example, other than erosion and mass wasting that can result when water is deep and flows at a high velocity, deep water has relatively little positive or negative effect on riparian vegetation. Vegetation of the types present along lower Cache Creek may begin to grow, usually very slowly, when inundated by shallow water, but ideal conditions do not occur until the floodplain soils are wet but not completely saturated. The duration of these conditions and the season during which they occur, which are determined both by the creek hydrograph and by the texture of the soils, are the most critical elements in supporting riparian vegetation.

Along the losing reaches of the study area (especially Hungry Hollow, Madison, and Guesisosi), the effects of upstream diversion of surface water are amplified by the porosity of the underlying sediments. Some improvement in availability of water to vegetation would be realized from establishing a no-disturbance zone along a low flow channel and thereby promoting deposition

of fines. However, under all realistic restoration scenarios, the habitat potential through these reaches will remain limited, so they should be regarded as a low priority area for active restoration actions involving use of surface water or planting of riparian vegetation.

Groundwater Levels

Groundwater levels have dropped below pre-1850 depths, as explained in Sections 4.2, 4.4, and 4.5. Pumping and diversion for irrigation have reduced the amount of water in the aquifer, and both water and aggregate removal has contributed to the degradation (downcutting) of the creek to a level far below original floodplain. Although non-riparian forest (even including some characteristically riparian species) persists on the high banks, genuine mixed riparian forest with its characteristic understory probably could no longer become established or be maintained, even by feasible artificial means, on these high banks. Therefore, efforts to establish and maintain riparian vegetation should be focused on areas within the present channel where near-surface groundwater persists for much or all of the growing season (primarily the Capay, Dunnigan Hills, and upper Hoppin subreaches) and on reclaimed aggregate pits. This approach means that the potential acreage of certain forest types that are best adapted to infrequent flooding (for example, riparian valley oak forest) will be limited. However, this reality is also imposed by present land use in the county.

Surface Disturbance

Not only does aggregate mining remove the vegetation that occurred on the mining site, but it also has indirect effects on flow velocity and regime, which in turn has likely altered the nature of the substrates available for recolonization. These effects occur not only at the mining site itself, but also upstream and downstream as a consequence of alteration of gradient and flow velocities.

Present in-channel mining often involves remining of depositional areas, which, as explained in Section 5.2, are the natural locations of establishment of new habitat. The direct effects of limited surface disturbance are reversible: on suitable microsites, completion of mining activity will be followed by natural revegetation within only a few growing seasons. In some sites, this colonization and succession process can be accelerated by limited replanting. However, where bar skimming or remining in general continues, it is impossible for succession or maturation of colonizing vegetation to occur until the surface disturbance ceases.

Riparian Habitat Planting Guidelines for Cache Creek

These guidelines apply to restoration sites on Cache Creek protected from scouring flows where near surface groundwater persists for much of the growing season, or on reclaimed aggregate pits. These are general guidelines that should be incorporated into a site-specific planting plan which provides details on seeding rates and mixes, container planting stock, planting locations and densities, planting techniques, irrigation requirements (if any), maintenance requirements, etc. Planting densities and species mixes may be based on data obtained from natural riparian habitat reference sites in the area supporting the desired vegetative composition. Once a suitable planting site has been selected, a plan approved, and the site prepared by smoothing and grading, the following steps should be taken to establish native riparian vegetation:

1. Site Preparation No additional site preparation will be necessary if planting is conducted immediately after grading and vegetation has not become established. If undesirable vegetation has become established on the site, it should be removed by mechanical means or approved herbicides such as glyphospate applied under supervision of a licensed applicator. Fertilizer should not be used because that would favor non-native vegetation.

2. Collection of Plant Materials All plant materials should be collected in the vicinity of the project site in order to maintain the genetic stock and provide the most site adapted ecotypes. If seeding of native herbaceous species is proposed, seeds should be collected, cleaned, tested for viability, and stored appropriately by a qualified native seed supplier. Cottonwood (*Populus* spp.) cuttings should be collected and contract-grown at a nursery with staff experienced in propagation of native plants. Willow (*Salix* spp.) cuttings can be collected from existing vegetation in the project vicinity and stockpiled for planting within 24 hours of collection. Willow cuttings should be from 21 to 24 inches in length and 3/4 to 1 1/2 inches in diameter at the base. Other woody riparian species should be collected and contract-grown from local seed by a qualified native plant

3. Planting Planting should be initiated in the fall after the first soaking rains. Container plants should be planted in holes dug at least twice as deep and wide as the plant container. The rootball should be thoroughly dampened before planting and the planting holes deeply irrigated prior to planting. After planting, the holes should be backfilled with native substrate material (with no mulch added) and thoroughly tamped to remove air pockets. Willow cuttings may be planted in clusters in planting holes prepared and backfilled in a similar manner. Trees, shrubs, and willow cutting clusters should be located in randomly spaced, naturally clumped patterns. Herbaceous seed mix (if used) should be hydroseeded (without hydromulch) or broadcast over the planting area, then covered with blown rice straw meeting State "weed-free" standards at one ton per acre. Soil stabilizer or tackifier such as Ecology Controls M-Binder should be included at 150 pounds per acre. Hydromulching is not recommended because of a history of poor results with native seedings.

4. Irrigation Irrigation may be necessary for the first one or two summers in drier sites to allow the roots to develop sufficiently to tap into the summer ground water level. A drip irrigation system may be installed with emitters to each tree, shrub, and willow cutting cluster. Deep irrigation may be necessary at least twice per month during dry periods for the first two years of establishment.

5. Weed Control The sites should be closely monitored for competing non-native vegetation. Non-native species can be sprayed or removed by hand as necessary to attain the success criteria.

6. Monitoring The site should be monitored for at least five years by a qualified biologist experienced in native plant restoration. The success of the revegation plan is typically measured in terms of percent coverage by native species, or the percentage of surviving planted shrubs and trees.