

SCWA Easements

- █ Owned In Fee-Engineered Channel
- █ Easement Engineered Channel
- █ Easement Modified Channel
- █ Easement Natural Channel

Elevation, ft.

- | | |
|---|--|
| █ Below Sea level | █ 500 - 1,000 |
| █ 0 - 25 | █ 1,000 - 1,500 |
| █ 25 - 50 | █ 1,500 - 2,000 |
| █ 50 - 75 | █ 2,000 - 2,500 |
| █ 75 - 100 | █ Above 2,500 |
| █ 100 - 250 | |
| █ 250 - 500 | |

- SCWA Flood Control Zone Boundary
- █ Water Bodies
- ~ Streams
- City Limits
- Reach Maps Index

Figure 4-30

Upper Laguna Subbasin



1:74,000



Sources:
Sonoma County Water Agency
County of Sonoma
California Spatial Information Library

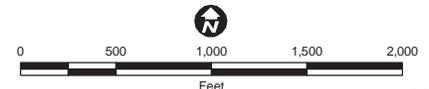


Vegetation Type

- Blackberry Scrub
- Mixed Riparian Scrub
- Riparian Woodland (full canopy)
- Riparian Woodland (up to 75% canopy)
- Riparian Woodland (up to 25% canopy)
- Riparian Forest
- Ruderal
- Willow Scrub
- Developed
- SMP Maintenance Reaches

Sources:
 Sonoma County Water Agency
 County of Sonoma
 AirPhotoUSA, 2005

FIGURE 4-31
Reaches and Vegetation
 Upper Laguna (1 of 11)



1 inch equals 1,000 feet



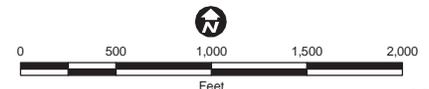
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- Blackberry Scrub
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- Developed
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- Ruderal
- Willow Scrub
- SMP Maintenance Reaches

Sources:
 Sonoma County Water Agency
 County of Sonoma
 AirPhotoUSA, 2005

FIGURE 4-32

Reaches and Vegetation Upper Laguna (2 of 11)



1 inch equals 1,000 feet

Todd Creek – Reaches 5 & 4

JURISDICTION: SCWA owned and maintained, unincorporated county area

LOCATION: Reach 5 begins ~500' upstream of the Dolores Ln. bridge and continues to Todd Rd. crossing; Reach 4 extends from Todd Rd. to Hunter Cr. confluence.

ADJACENT LAND USE: Mix of residential, agricultural, and light industrial uses. An open upland area of Reach 5 provides sediment management and restoration opportunities (see below)

UPSTREAM: Santa Rosa-Bellevue Conduit to and non-maintained Todd Cr.

LENGTH: Todd 5: 3,715 ft; Todd 4: 2,419 ft

CHANNEL EASEMENT CORRIDOR WIDTH: Todd 5: 129 ft
Todd 4: 112 ft

AVERAGE TOP-OF-BANK WIDTH: Todd 5: 55 ft
Todd 4: 51 ft



(b) Todd Creek Reach 5 looking upstream (north) from Dolores Ln. bridge; channel is clogged with abundant cattails and water plantain growth; low bench right of channel (east) shows signs of recent inundation and deposition during 2007 and 2008 winters. Reach has been observed during 2006-2008 period with continued cattail growth and deposited sediment (March 19, 2008).

MAINTENANCE HISTORY



(a) Todd Creek Reach 5 looking downstream from outfall of Santa Rosa – Bellevue Ave. Conduit pipe (right of people shown, beneath blackberry mass); Reach 5 experienced much sediment deposition and associated cattail growth; sediment removal and restoration activities occurred at Reach 5 in summer 2008 (March 19, 2008).

PHYSICAL CONDITIONS

Reach setting: south draining gentle gradient channel that traverses the alluvial plain toward the Hunter Creek confluence downstream; very depositional environment, especially in upper Reach 5 at SR-Bellevue conduit outfall at zone upstream of Dolores Ln. (Photo a); non-maintained East Fork of Todd Cr, drains headwaters east of Petaluma Hill Rd and joins Todd Cr in Reach 5; Reach 4 is a linear continuation of Reach 5 and joins Hunter Cr.

Active channel: upper reach, 6-8 ft wide increasing to 14-16 ft wide toward Robles Ave.; depth ranges from a few inches of diffuse flow through cattails in upper Reach 5 to channels 1 ft deep in lower reach, with some pools in Reach 4 that are 2-3 ft deep.

Bed sediments/texture: mostly silts and muds

Bank structure: trapezoidal channel mostly with 2:1 or steeper earthen slopes; with rock near bridge abutments and confluences.

Water quality (qualitative): open water between dense patches of emergent vegetation is turbid and stagnant with substantial algae growth and limited flow.

Todd Creek – Reaches 5 & 4

Channel processes: area upstream of Dolores Ln. functions as an instream basin (photos a, b) where the channel is aggrading and forming 1-3 ft high benches at base of banks and other in-channel depositional bar features; bars increase in size and height moving downstream toward Dolores Ln. Downstream of Dolores Ln. channel includes alternating sequence of depositional features and shallow pools (photos c, d, e).



(c) Todd Cr. Reach 5 looking downstream from Dolores Ln crossing to E. Robles Ave. bridge: channel alternates between vegetation patches clogging channel and open water. This pattern is seen throughout upper Todd Creek reaches downstream of Dolores Ln (March 19, 2008)



(e) Todd Creek Reach 5, looking upstream from Todd Road to Bucks Road. Similar to photo (c) note alternating sections of sediment deposits with cattails and open stagnant pools along low gradient stream (March 19, 2008).



(d) Todd Creek Reach 5 looking downstream between E. Robles and Bucks Road: confined low flow channel with depositional benches to either side; with patches of emergent vegetation; note height of recent flows (approx 2-3 ft above water surface elevation) (March 14, 2007).



(f) Todd Creek Reach 4 looking upstream just above the confluence with Hunter Creek: similar pattern to upstream sections with alternating sequence of depositional features (small bars or wedges with emergent vegetation) between open water and shallow pools. Channel is linear, trapezoidal with high bench access roads on crest of bank (March 14, 2007).

Todd Creek – Reaches 5 & 4

BIOLOGICAL CONDITIONS

Vegetation composition: riparian habitat in reach is dominated by herbaceous species with occasional riparian trees and shrubs.

Riparian corridor and canopy closure: limited woody canopy, typified by interspersed riparian shrubs and trees growing at the toe of slope and on the banks creates. Riparian corridor is limited to depositional benches forming the toe of slope and extends to the bank crest and adjacent access road, about 10-15 ft to each side.

Instream habitat: reaches follow a pattern of diffuse flow through congested sections of emergent vegetation with alternating with more open water stagnant pools. A few limited areas with longer runs and a more confined low-flow channel.

Listed species with potential to occur: potential habitat for western pond turtle; California tiger salamander are unlikely to occur in the upland habitat.

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Todd Creek, Reaches 5 and 4 focus on flow capacity and opportunities to improve water quality and riparian/aquatic habitat. The zone downstream of the SR-Bellevue Conduit outfall (upstream of Dolores Ln.) was severely impacted from deposited sediment and abundant cattail growth (photos a, b). In summer 2008, a SCWA maintenance project cleared the upper reach of excessive sediment and cattails. This project also included tree and shrub planting to improve wetland and aquatic habitats. This multi-objective approach was designed to provide flood management benefits, detain/retain stormflows, improve water quality, and also enhance ecosystem/habitat conditions. The adjacent upland area east of upper Reach 5 is owned by SCWA. This area provides an opportunity for sediment storage or additional restoration activities. Downstream of Dolores Ln., flow capacity seems constrained at crossings where sediment and debris have accumulated. Future maintenance activities may be needed to clear accumulated sediment and debris at such crossings. Water quality and habitat conditions in this reach appear to be sub-par (relative to other SMP channels) with generally poor circulation, poor bank conditions, and poor tree canopy. Planting a riparian canopy throughout Reaches 5 and 4 (either at either the toe of slope or bank crest) would provide shade and other benefits.

Todd Creek – Reaches 3, 2, & 1

JURISDICTION: SCWA owned and maintained

LOCATION: Unincorporated county area; from Hunter Creek confluence to Wilfred Creek

ADJACENT LAND USE: Mix of agricultural and industrial land uses; more industrial upstream of Scenic Ave and agriculture downstream

UPSTREAM: Todd Cr. (reaches 5, 4) and Hunter Cr. (reaches 2,1)

LENGTH: Todd 1: 2,013 ft
Todd 2: 2,313 ft
Todd 3: 673 ft

CHANNEL EASEMENT CORRIDOR WIDTH: Todd 1: 129 ft
Todd 2: 106 ft
Todd 3: 98 ft

AVERAGE TOP-OF-BANK WIDTH: Todd 1: 56 ft
Todd 2: 55 ft
Todd 3: 59 ft



(b) Todd Cr. Reach 3 looking upstream near Hwy 101 crossing toward Santa Rosa Avenue; pattern of turbid, stagnant slack-water between cattails that constrict flows (March 14, 2007).

MAINTENANCE HISTORY



(a) Todd Cr. and Hunter Cr. confluence; photo from Todd Cr. Reach 3 looking upstream to Reach 4 (left) and Hunter Cr. Reach 1 (right); note large vegetated sediment wedge in foreground downstream of confluence; sediment source areas on Sonoma Mtn. seen in distance (March 14, 2007).

PHYSICAL CONDITIONS

Reach setting: lower Todd Creek (Reaches 3, 2, 1) transitions from the southern Santa Rosa alluvial plain setting to the Laguna de Santa Rosa setting; the alternating pattern of dense in-channel emergent vegetation and slack water pools (observed upstream) intensifies downstream toward the Laguna with larger stands of vegetation covering the channel and longer, shallower open water areas.

Active channel: 20-30 ft. wide; depths range from 6 in. in areas covered by emergent vegetation to 1-2 ft. in long shallow runs.

Bed sediments/texture: mostly silts and muds typical to these depositional low gradient streams.

Bank structure: 2:1 to 3:1 sloped earthen banks with rock near crossings and confluences; at Wilfred Cr. Confluence channel becomes an open concrete conduit (see photo (a) in Wilfred-Bellevue Reach 4 sheet).

Water quality (qualitative): open water between dense patches of emergent vegetation is turbid and stagnant with substantial algae growth and limited flow.

Todd Creek – Reaches 3, 2, & 1

Channel processes: engineered trapezoidal channel with limited sinuosity; in locations channel is aggrading from mid-channel depositional bars and toe of bank sediment wedges; in locations, flow is blocked by

extensive vegetated sediment wedges that stretch from bank to bank reach; finer sediments are transported through sections with steeper gradients.

BIOLOGICAL CONDITIONS

Vegetation composition: reaches are dominated by either riparian woodland or ruderal grasslands.

Riparian corridor and canopy closure: these reaches contain significant woody canopy (up to 75% closure across the creek) between the confluence with Moreland Cr Conduit and Scenic Dr. Downstream of Scenic Dr riparian canopy is reduced and woody vegetation is generally confined beneath crest of bank, although some sections contain large oaks, redwoods, acacias, eucalyptus, and other woody species. Riparian corridor ranges in width from 20-40 ft on each side.

Instream habitat: reaches are dominated by alternating pattern of shallow diffuse flow through emergent vegetation sections with interspersed stagnant shallow runs.

Listed species with potential to occur: All reaches are potential habitat for western pond turtle; There is a moderate to high likelihood for California tiger salamander to occur in the upland habitat of Todd 1 and 2, they are unlikely to occur in the upland habitat of Todd 3.



(c) Todd Creek Reach 1 looking downstream from the Scenic Dr. crossing; gently sloped banks and extensive in-channel vegetation; note more limited growth of emergent vegetation in shaded areas versus the unshaded areas (March 14, 2007).



(d) Todd Creek Reach 1: stagnant flows and poor water quality impacts aquatic habitat in this reach (March 14, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Todd Creek, Reaches 1, 2, and 3 focus on flow capacity and opportunities to improve water quality and riparian/aquatic habitat. At both the upper and lower reaches, the key confluences showed high deposition and vegetation growth. Conditions in these sections should be monitored closely to evaluate if these sediments wedges reduce flow capacity below acceptable standards. Flow capacity issues seem exacerbated at crossings where future maintenance may be required to clear accumulated sediment and debris. Observed high water marks for 2007 were within a few feet of the top of bank. Water quality and habitat conditions in this reach appear to be sub-par (relative to other SMP channels) with generally poor circulation, poor bank conditions, and poor tree

Todd Creek – Reaches 3, 2, & 1

canopy. Opportunities to develop a low flow channel to transport finer sediments may help improve water quality and habitat conditions as well. Although riparian canopy exists in the middle of this reach, additional planting between Hwy 101 and the Moreland confluence and downstream of Scenic Dr. could improve water quality and habitat conditions.

Hunter Creek – Reaches 2 & 1

JURISDICTION: SCWA owned and maintained

LOCATION: Unincorporated county area; reaches extends from Hunter Ln Crossing (near Derby Ln) to confluence with Todd Cr.

ADJACENT LAND USE: Mix of agricultural and small ranch type agricultural

UPSTREAM: Hunter Creek 3

LENGTH: Hunter 2: 3,299 ft
Hunter 1: 1,592 ft

CHANNEL EASEMENT CORRIDOR WIDTH:
Hunter 2: 85ft
Hunter 1: 105 ft

AVERAGE TOP-OF-BANK WIDTH:
Hunter 2: 44 ft
Hunter 1: 52 ft



(b) Mid Reach 2 looking downstream: note past bank repair work with riprap to right; sloughed riprap falls into channel and forms a lower bank cobble bar (March 14, 2007).

MAINTENANCE HISTORY



(a) Hunter Creek Reach 2 looking downstream: Channel width increases from Reach 3 upstream and channel becomes broader; note proliferation of emergent vegetation across channel (March 14, 2008).

PHYSICAL CONDITIONS

Reach setting: Reaches 2 and 1 represent the transition from the alluvial fan (of Reach 3 above) onto the lower alluvial plain. Channel slope lessens moving downstream while channel width increases; streamflow increases downstream from daylighting of shallow subsurface flows.

Active channel: 6-8 ft wide; flow depth ranging from 4-10 in.

Bed sediments/texture: upper reaches mostly coarse to medium sands; lower reaches fine to medium to finer sands, with some silts near Todd Creek confluence; occasional cobbles in channel from eroded riprap (photo b).

Bank structure: 2:1 to 1:1 and steeper (photos b, c), mix of riprap and earthen slopes (photo b)

Water Quality (Qualitative): flows become more stagnant with decreased gradient downstream; stagnant water with algae is common between Hunter Ln. Extension Crossing and confluence with Todd Cr.

Channel processes: engineered linear channel; in lower reach channel is slightly aggrading with some deposition; caught debris indicates 5-6' of deposition in places; local riprap provides angular cobbles to bed.

Hunter Creek – Reaches 2 & 1

BIOLOGICAL CONDITIONS

Vegetation composition: near channel riparian habitat is dominated by annual grasses with isolated trees; upper banks (especially southern bank) contain widely-spaced corridor of oaks.

Riparian corridor and canopy closure: isolated oaks, mostly on top of bank on south side, create a canopy with limited closure (<25%); isolated willows/alders occur occasionally near the toe of slope; riparian corridor is dominated by annual grasses and ruderal vegetation. Riparian corridor is narrow due to steep banks and adjacent trail and properties; maximum width is ~15 ft.

Instream habitat: reach is straightened and generally homogeneous with two bed forms; (1) shallow and wide riffle/runs over rip rap (photo b); and (2) shallow and wide diffuse flow through emergent vegetation (photos a, c); the channel has almost no sinuosity and very little form complexity.

Listed species with potential to occur: Both reaches are potential habitat for western pond turtle. California tiger salamander is unlikely to occur in the upland habitat of either reach.



(c) Reach 1 looking downstream: note transition from coarser bed upstream; the lesser gradient results in shallow stagnant pools; grassy vegetation seen along steep banks (March 14, 2007).



(d) Sloughing bank along Hunter Creek in area with earthen banks. This channel at this site is straight and clogged with vegetation (March 14, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations at Hunter Creek Reaches 2 and 1 focus on potential bank erosion and channel capacity issues. These reaches demonstrate historic bank instability (photo b) and sloughing type erosion (photo d). It is uncertain whether bank stability issues are a function of the earthen materials the banks are made from, channel flow conditions and potential undercutting of banks, some type of animal burrowing, or other reasons. Future activities might consider development of a more defined low-flow channel that also directs flows away from banks in sections with historic bank problems. A low flow channel with more persistent flow throughout year may also alleviate problems of stagnant water observed. Additionally, planting of riparian and upland woody species may provide additional canopy and reduce growth and colonization of emergent vegetation within channel.



Vegetation Type

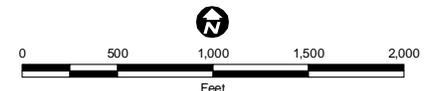
- Blackberry Scrub
- Mixed Riparian Scrub
- Riparian Woodland (full canopy)
- Riparian Woodland (up to 75% canopy)
- Riparian Woodland (up to 25% canopy)

- Riparian Forest
- Ruderal
- Willow Scrub
- Developed

SMP Maintenance Reaches

Sources:
 Sonoma County Water Agency
 County of Sonoma
 AirPhotoUSA, 2005

FIGURE 4-33
Reaches and Vegetation
Upper Laguna (3 of 11)



1 inch equals 1,000 feet

Hunter Creek – Reach 3

JURISDICTION: SCWA owned and maintained

LOCATION: Unincorporated county area; reach extends from Petaluma Hill Rd crossing to Hunter Lane Crossing (near Derby Ln)

ADJACENT LAND USE: Mix of agricultural and small ranch type agricultural

UPSTREAM: Un-named non-maintained headwater creeks

LENGTH: 2,648 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 54 ft

AVERAGE TOP-OF-BANK WIDTH: 36 ft



(b) Reach 3 looking downstream at westward channel bend: coarse cobble bed stream has widened from upstream; cobble bar features noted with a higher bar (left) and channel thalweg (right), white rock marks indicate calcification and flow levels; oak canopy increases downstream (March 14, 2007).

MAINTENANCE HISTORY



(a) Upper Reach 3, looking downstream (south): narrow channel with coarse pebble and cobble bed; banks are gentle and heavily covered with grasses with an open canopy of oaks. (March 14, 2007).

PHYSICAL CONDITIONS

Reach setting: reach is on alluvial fan just downstream of headwater areas of Sonoma Mountain. Headwater areas upstream of Petaluma Hill Rd. include a few unnamed tributaries. Reach is relatively steep (compared to other SMP channels) and is porous with a coarse cobble bed.

Active channel: 2-4 ft wide in upper reach (photo a), wider at bend (photo b); in March '07, the channel was dry upstream of the bend flowing subsurface beneath cobbles; downstream of bend flows daylight to shallow depth of 6 in.

Bed sediments/texture: cobbles and large gravels in upper reach (photos a, b) fining downstream into a mixture of cobbles, gravels, and coarse sands.

Bank structure: 3:1 or more gradual, with rock and earthen slopes.

Water quality (qualitative): moderate to good where surface water was present; steeper gradient prevents deposition of fines.

Channel processes: relatively steep cobble bed channel along historic alluvial fan; channel makes large western bend where it becomes east-west linear feature; flows occur subsurface in coarse section and then daylight in lower reach; finer sediments are transported through sections with steeper gradients.

Hunter Creek – Reach 3

BIOLOGICAL CONDITIONS

Vegetation composition: near channel riparian habitat is dominated by annual grasses with isolated trees; upper banks (especially on southern side) contain a solid corridor of oaks.

Riparian corridor and canopy closure: woody canopy from oaks increases from the top of the reach downstream of bend for ~1000' and then woody species become isolated and scattered. Most of canopy provided by row of oaks and other upland species planted along the southern bank. Riparian corridor is narrow in upper reach (7-10') to each side, but expands to 10-20' downstream.

Instream habitat: reach is intermittent, with shallow subsurface flow in coarse cobble sections; cobble bed sections provide good habitat complexity, but only appear to maintain ephemeral flows; reach becomes more intermittent (and maybe perennial) downstream, but is linear with limited pools, riffles, or other significant features.

Listed species with potential to occur: potential habitat for foothill yellow-legged frog and western pond turtle; California tiger salamander are unlikely to occur in the upland habitat.



(c) Downstream of main bend, the transition between subsurface and daylighting flows is observed. Channel is wet with no visible surface flow. Channel bed becomes more fine downstream from cobbles toward gravels and coarse sands (March 14, 2007).



(d) Looking downstream along the straightened and wetted section of lower Reach 3. Note difference to coarse cobble sections upstream. Flat benches flank low flow channel on both sides of stream with steep (1:1) bank above. Woody species become isolated and occasional (March 14, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations and opportunities are not pressing at this reach. Potential problems with flooding or overbank flows were not observed. There was little observation of fine sediment deposition reducing in-channel capacity, and little or no evidence of problems related to emergent vegetation. The downstream portion of the reach could benefit from additional planting of riparian or upland trees along the banks to provide more channel shading. However, if land use changes in the upper headwaters (just immediately upstream) were to increase erosion or runoff; then this reach may be sensitive to such changes.



Upper Laguna Subbasin



Vegetation Type

- Blackberry Scrub
- Mixed Riparian Scrub
- Riparian Woodland (full canopy)
- Riparian Woodland (up to 75% canopy)
- Riparian Woodland (up to 25% canopy)

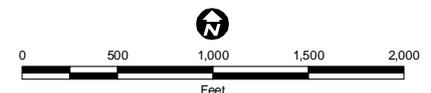
- Riparian Forest
- Ruderal
- Willow Scrub
- Developed

||| SMP Maintenance Reaches

Sources:
Sonoma County Water Agency
County of Sonoma
AirPhotoUSA, 2005

FIGURE 4-34

Reaches and Vegetation Upper Laguna (4 of 11)



1 inch equals 1,000 feet

Bellevue-Wilfred Channel – Reach 4

JURISDICTION: SCWA owned and maintained

LOCATION: Unincorporated county area; reach is from Todd Cr./Wilfred Cr confluence (photo a) to Millbrae Ave Crossing (photo d)

ADJACENT LAND USE: Agriculture: grazing/pasture

UPSTREAM: Todd Cr Reach 1 & 2 and lower concrete section of Wilfred Creek

LENGTH: 2,385 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 121 ft

AVERAGE TOP-OF-BANK WIDTH: 79 ft



(b) Reach 4 looking downstream from first bend at railroad crossing; note wide channel, 10-12 ft below banks, with small point bar forming at inside of meander bend; riprap seen along outside bank (lower left); flow depth is 1-2 ft deep (March 14, 2007).

MAINTENANCE HISTORY



(a) Upper end of Reach 4, looking upstream to Todd Cr Reach 1 (left) and Wilfred Cr (at center); note drop structure at base of Wilfred Cr. and sediment wedge at confluence (March 14, 2007).

PHYSICAL CONDITIONS

Reach setting: reach flows through low gradient topography of the lower alluvial plain; receives input flows from Wilfred Cr. and Todd/Hunter systems upstream; reach is northern branch of Upper Laguna system and experiences backwatering.

Active channel: ~30 ft wide, with 10-12 ft high banks, flows observed were 1-2 ft deep.

Bed sediments/texture: mostly silts and muds, with some sands collecting on bars or through thalweg.

Bank structure: 1.5:1 to 2:1 or steeper trapezoidal earthen slopes (photo b); occasional rock slope protection along outer channel bends; concrete reinforcement at Todd/Wilfred confluence.

Water quality (qualitative): turbidity moderate to low, water is generally flowing and not stagnating.

Channel processes: engineered channel with modest sinuosity that may follow historic stream alignment; aside from the depositional wedge at confluence of Todd and Wilfred creeks, deposition is limited to a few point bar formations formed at channel bends; with bars increasing in size and height moving downstream.

Bellevue-Wilfred Channel – Reach 4

BIOLOGICAL CONDITIONS

Vegetation composition: Riparian habitat in reach is dominated by herbaceous ruderal species with occasional riparian trees and shrubs including oaks and walnuts.

Riparian corridor and canopy closure: Limited woody canopy, with interspersed riparian shrubs and trees growing on the banks, has little to no canopy closure; riparian corridor is limited to toe of slope to levee hinge point (~15 ft) on each side.

Instream habitat: Reach maintains some sinuosity with related pools and shallower riffles; the reach contains several wide sections with 1-2 ft deep shallow runs; no coarse substrate observed in the channel; aquatic habitat is limited to shallow submerged bars, long runs, and occasional pools.

Listed species with potential to occur: Potential habitat for western pond turtle; moderate to high likelihood for occurrence of California tiger salamander in potential upland habitat.



(c) Mid Reach 4 looking downstream; note pool formed by large sediment and debris wedge blocking flows. Pool depths are in excess of 6 ft (March 14, 2007).



(d) Lower Reach 4 looking downstream to Millbrae Avenue; note large "D-shaped" bar along base of left bank where sediments collect on inner bend of channel (March 14, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations and opportunities for Bellevue-Wilfred Reach 4 are not extensive. There is a large sediment and debris blockage in the middle of the reach (photo c) but this dam and pooling do not appear to be creating any immediate flow hazard. This blockage should be monitored and may eventually require some clearing. Upper Reach 4 appears to have a steeper gradient than the lower Reach 4. The upper reach has some sinuosity and stream velocities under lower-flow conditions appear to be adequate to prevent settling and enable transport of finer sediments downstream. Besides the potential removal of sediment/debris at the blockage noted above, another opportunity includes enhancing the woody riparian corridor which is often lacking. Planting of riparian trees along the upper banks could benefit water quality and enhance habitat for a suite of species. Trash, plastic and other debris are observed in the lower reach and may need removal.

Bellevue-Wilfred Channel – Reaches 3, 2, & 1

JURISDICTION: SCWA owned and maintained

LOCATION: Unincorporated county area; from Millbrae Ave Crossing to confluence with Laguna de Santa Rosa

ADJACENT LAND USE: Agricultural: grazing/pasture

UPSTREAM: Bellevue-Wilfred Reach 4

LENGTH: Bellevue-Wilfred 3: 1,822 ft
Bellevue-Wilfred 2: 1,987 ft
Bellevue-Wilfred 1: 3,988 ft

CHANNEL EASEMENT CORRIDOR WIDTH:
Bellevue-Wilfred 3: 149 ft
Bellevue-Wilfred 2: 173 ft
Bellevue-Wilfred 1: 163 ft

AVERAGE TOP-OF-BANK WIDTH:
Bellevue-Wilfred 3: 89 ft
Bellevue-Wilfred 2: 117 ft
Bellevue-Wilfred 1: 142 ft



(b) Reach 3 looking upstream from Whistler Ave Bridge; note channel widens moving downstream; extensive mud deposits flank both side of the channel (March 14, 2007).



(a) Reach 3 looking downstream from Millbrae Ave Bridge; low gradient stream with mud deposits collect along banks (lower left) (March 14, 2007).

PHYSICAL CONDITIONS

Reach setting: low gradient setting nearing Laguna; reaches exhibit stillwater qualities, backwatering effects, and abundant mud deposits.

Active channel: ~30-40 ft wide, widening toward downstream Laguna, bank height averages 6-8 ft, flow depths are 0.5-1.5 ft deep.

Bed sediments/texture: dominated by fine sediments, muds.

Bank structure: 2:1 earthen slopes; wide channel cross-section with smooth muddy channel bed.

Water quality (qualitative): turbidity moderate to high, water flows very slowly, but is not stagnant.

Channel processes: engineered channel, very straight from Reach 2 downstream (photos b/c); deposition occurs along channel margins as toe of slope mud bars; depositional features increase as the channel widens downstream toward the Laguna.

MAINTENANCE HISTORY

Bellevue-Wilfred Channel – Reaches 3, 2, & 1

BIOLOGICAL CONDITIONS

Vegetation composition: riparian habitat in reach is dominated by ruderal herbaceous species with occasional riparian trees and shrubs; mapping from 2006-2007 found stretches of this reach are emergent wetlands within the ordinary high water mark. Due to recent removal of ludwigia from the channel, there were many areas of unvegetated mudflats.

Riparian corridor and canopy closure: almost zero woody canopy; riparian corridor is limited to toe of slope to levee hinge point (~10 ft) on each side and generally is without woody species.

Instream habitat: engineered reach is generally straight, limiting formation of point bars and pools; instream habitat is limited to shallow, muddy, and exposed runs/glides.

Listed species with potential to occur: All reaches are potential habitat for western pond turtle; There is a moderate to high likelihood for California tiger salamander to occur in the upland habitat of all three reaches; Reach 1 is potential habitat for listed plant species.



(c) Reach 1 looking downstream from Wilfred Avenue toward Laguna; channel widens, slope decreases, and mud bars along channel margins increase moving downstream; mud deposits indicate backwatering and quiet depositional environment of Laguna system (March 14, 2007).



(d) Reach 1 looking downstream toward confluence with Upper Laguna Reach 2; note the Laguna system characteristics of wide channel, very low slope, still water quiet depositional zone dominated by muds and fine sediments, vegetation grows along banks and toe of slope areas (March 14, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Future management considerations for the lower Bellevue-Wilfred reaches are not extensive. Recent management actions in these reaches included removal of expansive beds of invasive ludwigia. The effectiveness of ludwigia removal should be monitored with additional plant removal as deemed necessary. Due to the abundant sedimentation issues experienced in the Laguna just downstream, future management opportunities could focus on using the reach as an instream sediment basis to trap and remove fine sediments before they enter the Laguna. The riparian corridor of these lower Bellevue-Wilfred reaches are devoid of woody species; additional planting of riparian tree species could benefit water quality and enhance habitat for a suite of species.

Wilfred Creek – Reach 1

JURISDICTION: Owned and maintained by SCWA

LOCATION: Rohnert Park, along channel from Snyder Lane to Santa Rosa Avenue

ADJACENT LAND USE: Upstream of confluence with Wilfred Extension residential to south and agricultural to north; downstream vernal pool preserves to south and agricultural to north.

UPSTREAM: Straightened channel reach toward Petaluma Hill Rd (not maintained by SCWA)

LENGTH: 7,878 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 68 ft

AVERAGE TOP-OF-BANK WIDTH: 52 ft



(b) Wilfred Creek upper reach, looking upstream toward Snyder Lane crossing; channel has shallow cross-section with abundant sediment accumulation and vegetation across the entire channel; poorly defined low flow channel (March 14, 2007).

MAINTENANCE HISTORY



(a) Wilfred Creek just downstream of Snyder Lane crossing and culvert; note abundant deposition in channel with over 50% of culvert passage blocked; note headwater areas of Wilfred Creek in distance (March 14, 2007).

PHYSICAL CONDITIONS

Reach setting: Reach 1 is in the alluvial fan/plain setting where channel gradients are less steep than in the headwaters above (photos a, b); sediments are transported to this reach and often deposited (photos a, b); In lower reach downstream of Wilfred Extension confluence and grade control structure the channel cross-section doubles in width (photos c, e).

Active channel: upper reach channel is 4-6 ft wide and shallow (<0.5 ft) with diffuse flow through cattails and water plantain; channel widens below confluence at Wilfred Extension, becoming 10 ft wide and 1-3 ft deep (photo c).

Bed sediments/texture: fine to medium sands and silts

Bank structure: in upper reach, the aggraded channel creates shallow and gentle (approx 3:1) banks (photo b); below grade control, channel is incised with 2:1 slopes; earthen sandy banks throughout; some slight bank slumping observed in south facing banks downstream of Wilfred Extension (photo d), and some sloughing observed in lower portions of the reach.

Water quality (qualitative): moderate turbidity with substantial algal production in pools upstream of drop structure.

Wilfred Creek – Reach 1

Channel processes: upper reach is largely depositional (photos a, b); lower reach downstream of grade control has occasional deposition with increasing presence of in-channel bars and wedges toward Santa Rosa Avenue (photos c, e).

BIOLOGICAL CONDITIONS

Vegetation composition: entire reach is dominated by herbaceous species with occasional riparian and non-riparian trees; north bank is dominated by blackberry scrub and south bank is dominated by ruderal grasses and herbaceous species.

Riparian corridor and canopy closure: upstream of the grade control structure, the corridor contains isolated areas with ~25% canopy closure, but is mostly dominated by herbaceous ruderal habitats with 0% canopy; below grade control at Wilfred Extension the reach exhibits 0% canopy closure with occasional upland trees at top of bank.

Instream habitat: Reach is linear and confined; upper reach has diffuse shallow flow through a heavily vegetated and sedimented channel bottom with occasional stagnating pools; downstream of grade control, wider channel provides more open water habitat.

Listed species with potential to occur: potential habitat for western pond turtle.



(c) Wilfred Cr Reach 1 looking downstream from grade control structure at Wilfred Extension confluence; note wider open channel with steeper banks than upstream punctuated by occasional in-stream vegetated bars and sediment wedges (March 14, 2007).



(d) Area of potential bank slumping in lower reach (March 14, 2007).

Wilfred Creek – Reach 1



(e) Looking upstream from Santa Rosa Avenue Bridge; note most of channel is open and free of depositional surfaces but about 50 ft upstream of crossing sediment and debris begin to collect (March 14, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

For Wilfred Creek Reach 1, the key maintenance consideration in the upper reach is the removal of sediment from the Snyder Lane culvert and area immediately downstream. There may also be an opportunity to design an appropriately sized low flow channel that would create a more defined channel capable of conveying finer sediments under smaller flows. Considering this reach's location in the watershed and the observed sedimentation, this reach may benefit from erosion control opportunities in headwater areas.

In the lower reach below the grade control structure, banks should be monitored for material sloughing, increased rodent burrowing, or more serious potential bank slumping. In the lower reach, planting of riparian species along the toe of slope and/or levee crest could help reduce water temperature and create more habitat for riparian wildlife species. Removal of blackberry thicket and other non-native species could also prove beneficial for maintaining flood conveyance and increase habitat values. Due to the sensitivity of the adjacent vernal pool preserve any maintenance activity in Wilfred Reach 1 should consider potential effects to the preserve. At the lower end of the reach, sediment and debris collecting just upstream of the Santa Rosa Ave. crossing should be monitored for accumulation and potential removal. This does not appear to be problematic under current conditions.

Wilfred Creek Extension – Reach 1

JURISDICTION: Upper reach owned by City of Rohnert Park with SCWA maintenance easement; lower reach owned and maintained by SCWA

LOCATION: From Foxtail Golf Club (approx 800 ft upstream of Fauna Ave) to confluence with Wilfred Creek

ADJACENT LAND USE: Upper reach bordered by residential; downstream in SCWA ownership vernal pool preserve east and west of the channel (photo d)

UPSTREAM: Coleman Creek Reach 1 and the Foxtail Golf Club

LENGTH: 2,569 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 75 ft

AVERAGE TOP-OF-BANK WIDTH: 67 ft



(b) looking downstream near Fauna Drive; turbidity that was observed nearer to golf course upstream now lessens, low flow channel is narrower (2-4 ft) with low sinuosity, upper banks are gently sloped, lower banks drop 1-2 ft into channel and are earthen, riparian canopy is sporadic (March 14, 2007).

MAINTENANCE HISTORY



(a) upper end of Wilfred Extension looking upstream toward golf course; note lack of depositional features, moderate turbidity, steep immediate channel bank dropping into channel with a gently sloping upper bank providing a wide easement area (March 14, 2007).

PHYSICAL CONDITIONS

Reach setting: reach begins at golf course; collects flows from the golf course and Coleman Creek upstream; sediments (mostly sands and silts) are deposited in golf course detention basins just upstream; upper reach (photos a, b) transitions from golf course to a linear and uniform channel downstream (toward Wilfred confluence); channel becomes more deeply set beneath steeper banks towards Wilfred confluence (photos c, e).

Active channel: upper reach channel is 4-6 ft wide and 6-18" deep; lower reach channel is 5-8 ft wide and 6-12" deep.

Bed sediments/texture: upper reach is mostly medium sands with coarsening downstream; lower reach toward confluence includes 8-12" cobbles and small boulders derived from local rip rap eroded from banks.

Bank structure: upper reach has earthen banks, sloped 3:1 or gentler with 2 ft drop at channel (photos a, b); lower reach has un-grouted rip-rap banks at 2:1 (or steeper) through preserves (photos c, e).

Channel processes: upstream of the reach much of the sediment is deposited in golf course detention basins; in the upper reach very limited deposition observed; lower reach is

Wilfred Creek Extension – Reach 1

shallow and coarse from local rip rap that falls into channel.

Water quality (qualitative): turbidity is moderate as it exits the golf course and then decreasing through reach.

BIOLOGICAL CONDITIONS

Vegetation composition: upper reach contains a mix of non-riparian tree species; lower reach is dominated by ruderal vegetation and occasional willows.

Riparian corridor and canopy closure: the upper reach is dominated by ruderal vegetation with occasional willows; upper banks with a variety of non-riparian woody species with canopy closure between 0%-25%; lower reach exhibits 0% canopy closure.

Instream habitat: upper reach has low sinuosity with some very small pools and point bars where habitat is dominated by narrow runs approx 1-2 ft deep; lower reach is very straight, incised beneath steeper banks, with flows over rip-rap cobbles.

Listed species with potential to occur: potential habitat for western pond turtle.



(c) looking downstream from SCWA owned section; channel becomes straight and incised beneath much steeper banks; banks have changed from shallow earthen to steep rip-rap; rip-rap also covers the channel bottom (March 14, 2007).



(d) looking east from top of levee into vernal pool habitat reserve (March 14, 2007).

Wilfred Creek Extension – Reach 1



(e) looking upstream from Wilfred Cr into linear channel of lower Wilfred Extension; note deeper channel than observed upstream (photos, a, b, c); deposition and blockage at the confluence was the only major depositional feature observed in the reach (March 14, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Different than most reaches in the SMP, this reach does not have an access road to either side of the channel. The lower reach traverses a vernal pool habitat restoration area and preserve. Special status species considerations should be reviewed in preparing for any maintenance in the preserve area. Field observations did not indicate that this channel has reduced capacity or is in need of immediate maintenance activities. The channel cross-section and easement in the upper reach is wide, at least 80-100 ft from fence line to fence line and the channel does not appear to convey significant flows. The golf course upstream appears to provide both sediment storage and flow detention functions. Additional considerations might include bank repairs on the lower reach where rip-rap appears to be sloughing, and/or removal of the debris and sediment blockage at the confluence with Wilfred Creek (photo e).



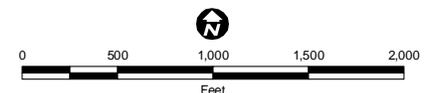
Vegetation Type

- Blackberry Scrub
- Mixed Riparian Scrub
- Riparian Woodland (full canopy)
- Riparian Woodland (up to 75% canopy)
- Riparian Woodland (up to 25% canopy)
- Riparian Forest
- Ruderal
- Willow Scrub
- Developed

||| SMP Maintenance Reaches

Sources:
Sonoma County Water Agency
County of Sonoma
AirPhotoUSA, 2005

FIGURE 4-35
Reaches and Vegetation
Upper Laguna (5 of 11)



1 inch equals 1,000 feet

Coleman Creek – Reach 1 & Cook Creek – Reach 1

JURISDICTION: Owned by City of Rohnert Park, SCWA maintenance easement

LOCATION: Outlet of Cook Creek Conduit at Golis Park (photo a) to Coleman Creek crossing at Snyder Lane

ADJACENT LAND USE: Municipal park and single family residential

UPSTREAM: Coleman Creek culvert and Cook Creek conduit

LENGTH: Coleman1: 923 ft.
Cook 1: 865 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Coleman1: 71 ft.
Cook 1: 77 ft.

AVERAGE TOP-OF-BANK WIDTH:
Coleman1: 45 ft.
Cook 1: 49 ft.



(b) confluence of Cook Creek and Coleman Creek, looking downstream along rip-rapped bank (March 14, 2007).

MAINTENANCE HISTORY



(a) looking downstream from Cook Creek outlet at upper end of reach in Golis Park; note in-channel sedimentation and vegetation directly downstream of outlet (March 14, 2007).

PHYSICAL CONDITIONS

Reach setting: These reaches represent the daylighting at the terminus of the Cook Creek and Coleman Creek conduits. Steeper gradients found in higher alluvial fans upstream now transition to gentler gradients toward the alluvial plain.

Active channel: Open water channel is 4-6 ft wide and 1-2 ft deep; pinched by vegetation in locations downstream of confluence (photo c).

Bed sediments/texture: Medium/fine sands and silts; fines trapped by cattails (photo c); bed and banks include grouted riprap drop structure just upstream of Snyder crossing (photo d).

Bank structure: Slopes are steep (1:1) and mostly earthen (photo c); riprap reinforced banks near Cook/Coleman confluence (photo b).

Water quality (qualitative): Relatively higher turbidity than other SMP reaches observed in flowing and stagnant sections.

Channel processes: Small bars forming in the channel at the toe of banks (photo c); “D” bars (winged shaped) alternate along banks, forming a wedge of sediment that transitions up to the side of the bank; above Snyder crossing, the creek flows beneath the grouted drop structure and bubbles to surface at base of the structure (photo d).

Coleman Creek – Reach 1 & Cook Creek – Reach 1

BIOLOGICAL CONDITIONS

Vegetation composition: Upper reach contains a mix of redwoods, oaks, willows, and alders on the north side providing shade and canopy closure; cattails block up to 80% of the channel in areas.

Riparian corridor and canopy closure: In the upper part of this reach, riparian woodland forms a 5-15 ft wide corridor on each bank; canopy closure throughout reach between 25%-75%.

Instream habitat: Reach has limited sinuosity around in-channel bars, some 1-2 ft deep runs are found with occasional backwatering into pools behind bars (dominated by cattails).

Listed species with potential to occur: None.



(c) looking upstream; about 300 ft downstream of Cook/ Coleman confluence and 1000 ft upstream of the Snyder Lane crossing; channel narrows around toe of bank sediment bars (2-3 ft high and 3-4 ft wide), attracting cattails and trapping additional sediment above bar onto bank (March 14, 2007).



(d) from Snyder Lane crossing looking upstream; creek flows mostly below grouted riprap of drop structure, then collects in a pool at the bridge crossing (March 14, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Coleman/Cook Reach 1 focus on sediment sources, in-channel deposition and vegetation, and maintenance of existing structures. The two tributaries to this reach (Cook Creek and Coleman Creek) drain highly erosive watershed source areas. A large landslide in Cook Creek headwaters sheds sediment to the Cook Creek Sediment Basin (upstream of Reach 1), whereby additional sediments arrive to Coleman/Cook Reach 1 through the Cook Creek conduit (photo a). The landslide and other headwater sediment sources are currently being addressed through the Watershed Partnership Program. The steep and riprapped banks at the bend in channel at the creek confluence (photo b) should be periodically observed for stability and erosion. Downstream in-channel sedimentation and associated vegetation (photo c) should be monitored for potential skimming/removal if needed. Horizontal skimming can maintain some channel sinuosity with a reduced bar profile. Flows appear to backwater at Snyder Lane crossing, yet sedimentation occurs more heavily downstream of crossing (see Coleman Reach 2 description).

Coleman Creek – Reach 2

JURISDICTION: Owned by City of Rohnert Park, SCWA maintenance easement

LOCATION: Snyder Lane crossing to Hillview Way, and 75 ft to either side of Fairway Drive near golf course

ADJACENT LAND USE: Single family residential and golf course

UPSTREAM: Coleman 1

LENGTH: 1,143 ft.

CHANNEL EASEMENT CORRIDOR WIDTH: 77 ft.

AVERAGE TOP-OF-BANK WIDTH: 42 ft.



(b) upstream of Hillview Way, looking upstream toward Snyder Lane: low-flow channel obscured by cross-channel sedimentation and cattails and other vegetation; lack of riparian trees results in no shade, especially on south bank (right); shade planting as proposed with 2008 restoration activities will help reduce cattail development in channel; note recent high water mark seen at base of northern bank to left; note headwater sediment source areas of Sonoma Mountain in distance (March 14, 2007).

MAINTENANCE HISTORY



(a) looking downstream from Snyder Lane crossing; abundant in-channel sedimentation and cattail growth (March 19, 2008).

PHYSICAL CONDITIONS

Reach setting: depositional reach, transitional from steeper gradient alluvial fan environment upstream to lower gradient alluvial plain downstream, headwater sediment source areas of Coleman Cr. and Cook Cr. seen in distance in photo b.

Active channel: channel bed width is ~16 ft, with active wet channel in the upper reach only 2-4 ft wide and 0.5-1 ft deep, in mid and lower reach active channel is shallow and diffuse (braided) through dense vegetation growing in the channel (photos).

Bed sediments/texture: medium-fine sands and silts; finer than Reach 1 upstream.

Bank structure: banks are earthen, sloped at approx 2:1.

Channel processes: aggradation and deposition of sediment across the channel bed width; individual bars in upper reach transition to sediment wedge that spans the entire channel bottom (photos a, b, c, d).

Coleman Creek – Reach 2

BIOLOGICAL CONDITIONS

Vegetation composition: dominated by non-native grasses with occasional alders or willows; emergent vegetation fills greater than 80% of the channel for most of the reach.

Riparian corridor and canopy closure: very little woody vegetation in entire reach; 0% canopy closure across the creek.

Instream habitat: linear channel alignment with narrow low flow stream (1-2 ft. wide), sometimes sinuous in upper reach around bars (photo a) but becomes more shallow and diffuse through vegetated sediment wedges that occupy entire channel bottom (photos b, c, d).

Listed species with potential to occur: None.



(c) looking upstream from Hillview Dr. crossing; diffuse flow in a few small and shallow channels; abundant sedimentation across entire channel width; lack of woody riparian species provides no shading, recent high water mark seen along base of banks (March 14, 2007).



(d) same view as photo (c) but taken March 19, 2008; note abundant cattail growth and continued sedimentation at Hillview crossing between 2007 and 2008.



(e) looking downstream from Hillview Dr. crossing to golf course; abundant in-channel sedimentation has created shallow cross section with reduced capacity (March 19, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Coleman Creek Reach 2 experiences abundant sedimentation where the entire channel bed is actively aggrading. The channel bed and banks are nearly devoid of any riparian trees or canopy. As a result, the channel has no shading and stream temperatures are elevated. The combination of a low stream gradient, heavy deposition of fine sediments, and lack of shade contribute to excessive growth of cattails and other emergent vegetation within the channel. Management considerations include removal of existing channel bed sediment and cattails and planting of riparian canopy where feasible shading. Additional sediment source control in headwaters areas is advantageous and is supported through the Watershed Partnerships Program (sediment source area control also described in Coleman Reach 1 & Cook Reach 1).

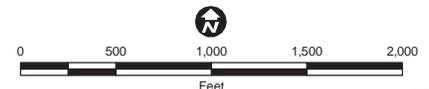


Vegetation Type

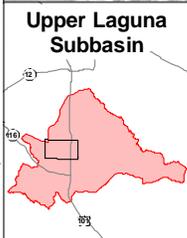
- Blackberry Scrub
- Mixed Riparian Scrub
- Riparian Woodland (full canopy)
- Riparian Woodland (up to 75% canopy)
- Riparian Woodland (up to 25% canopy)
- Riparian Forest
- Ruderal
- Willow Scrub
- Developed
- SMP Maintenance Reaches

Sources:
Sonoma County Water Agency
County of Sonoma
AirPhotoUSA, 2005

FIGURE 4-36
Reaches and Vegetation
Upper Laguna (6 of 11)



1 inch equals 1,000 feet



Vegetation Type

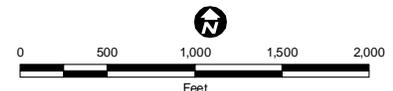
- Blackberry Scrub
- Mixed Riparian Scrub
- Riparian Woodland (full canopy)
- Riparian Woodland (up to 75% canopy)
- Riparian Woodland (up to 25% canopy)

- Riparian Forest
- Ruderal
- Willow Scrub
- Developed

—|—| SMP Maintenance Reaches

Sources:
Sonoma County Water Agency
County of Sonoma
AirPhotoUSA, 2005

FIGURE 4-37
Reaches and Vegetation
Upper Laguna (7 of 11)



1 inch equals 1,095.078331 feet

Hinebaugh Creek – Reaches 3 & 2

JURISDICTION: Reach 3 upstream of Hwy 101 owned by City of Rohnert Park, SCWA maintenance easement; downstream of Hwy 101 and Reach 2 SCWA owned and maintained

LOCATION: Reach 3: Commerce Blvd. to Redwood Dr.
Reach 2: Redwood Dr. to Labath Ave

ADJACENT LAND USE: Commercial

UPSTREAM: Hinebaugh 4

LENGTH: Hinebaugh 3: 1,629 ft.
Hinebaugh 2: 1,239 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Hinebaugh 3: 51 ft.
Hinebaugh 2: 105 ft.

AVERAGE TOP-OF-BANK WIDTH:
Hinebaugh 3: 87 ft.
Hinebaugh 2: 88 ft.



(b) looking upstream into lower end of Reach 3 (downstream of Highway 101) seen from Redwood Drive (May 29, 2007).

MAINTENANCE HISTORY



(a) looking downstream from upper end of Reach 3 at Commerce Blvd; note very linear and symmetrical channel; gradient is gentle in alluvial plain zone; Highway 101 crossing seen in distance (March 6, 2007).

PHYSICAL CONDITIONS

Reach setting: very linear and trapezoidal channel in central Rohnert Park, gentle gradient in alluvial plain geomorphic setting, Reach 3 crosses beneath Highway 101.

Active channel: Reach 3 is 14-16 ft wide upstream of Highway 101 with a depth estimated at approx 1-3 ft, and is 16-20 ft wide downstream of Highway 101 and into Reach 2.

Bed sediments/texture: generally finer materials (silts, fine sands, and muds) similar to Hinebaugh Creek upstream reaches, with some occasional coarser sands, and cobbles derived from local rip-rap; in lower Reach 3 and Reach 2 cattails trap fine sediments.

Bank structure: symmetrical trapezoidal channel form with banks sloped from 1:1 to 2:1; lower banks drop from bench/access roads 5-7 ft down into active channel; banks comprised of earthen material and small rip rap in places.

Water quality (qualitative): flows are somewhat turbid with suspended sediments (observed 5 days after storm event) delivered from upstream reaches.

Channel processes: linear channel alignment, gradient changes occur mostly at/near key road crossings (Commerce Blvd., Hwy 101, Redwood Dr.) with gentle gradients between; cattail growth in lower Reach 3 and Reach 2 traps and causes sedimentation (photos c, d).

Hinebaugh Creek – Reaches 3 & 2

BIOLOGICAL CONDITIONS

Vegetation composition: canopy closure between 0%-25%; banks composed of ruderal grasses and Himalayan blackberry. Large areas of emergent wetland dominated by cattails below the ordinary high water mark.

Riparian corridor and canopy closure: 0-50 ft. wide corridor on each bank; canopy closure between 0%-25%.

Instream habitat: in-channel areas dominated by cattails and emergent wetland may obstruct fish passage at low flows; exposed open water areas appear to be experiencing increased water temperatures and stagnation; emergent wetland vegetation provides some bird habitat. According to DFG and SCWA biologist, there is no suitable steelhead rearing habitat in this reach.

Listed species with potential to occur: potential migratory habitat for steelhead, likely habitat for California tiger salamander, potential habitat for western pond turtle.



March 6, 2007



March 6, 2007



May 29, 2007



May 29, 2007

(c) Hinebaugh Creek Reach 2 looking downstream from Redwood Road crossing.

(d) Hinebaugh Creek Reach 2 looking upstream from Labath Avenue crossing.

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Hinebaugh Creek Reaches 2 and 3 focus on removal of cattails and canopy development to discourage their regrowth. Significant in-channel cattail growth is observed in lower Reach 3 and Reach 2. Some smaller bars are observed associated with the cattail growth. Integrated cattail and sediment removal can be considered for these reaches. In terms of opportunities, Reaches 3 and 2 have clear access roads to either side of the channel, which provides good top of bank access for vegetation thinning work. These reaches are the most downstream reaches in urban Rohnert Park, but are upstream of the more rural and natural Laguna setting in Reach 1 downstream. As such, there may be opportunities along these reaches for stormwater and water quality treatments (though that is currently beyond the maintenance scope of the SMP program).

Hinebaugh Creek – Reach 1

JURISDICTION: SCWA owned and maintained, located in the City of Rohnert Park

LOCATION: Downstream of Reach 2 to confluence with Laguna 2

ADJACENT LAND USE: Residential to the south; commercial and agricultural to the north.

UPSTREAM: Hinebaugh Creek Reach 2

LENGTH: 4,881 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 131 ft

AVERAGE TOP-OF-BANK WIDTH: 97 ft



(b) looking downstream from the “big bend” in the reach; note depositional environment and sediment bars forming along inner bend (and covered with cattail vegetation) and active channel running along outer bend also showing sedimentation (March 6, 2007).



March 6, 2007



May 29, 2007

(a) Upper end of Reach 1, looking downstream from Labath Avenue; note extensive willow and cattail vegetative growth during spring season.

MAINTENANCE HISTORY

PHYSICAL CONDITIONS

Reach setting: transitional reach in three ways: (1) from urban Rohnert Park setting to more agricultural and open space area; (2) from linear trapezoidal channel to more natural Laguna-type channel downstream; and (3) from fluvial processes to lagoonal and backwatering processes in lower reach.

Active channel: wide channel alignment downstream of “big bend”; active channel width approx 12-16 ft in upper reach, widening to up to 30 ft in lower reach. Under low flow conditions depth approx 1-3 ft.

Bed sediments/texture: silts and some fine sands, fining to mostly silts/mud downstream.

Bank structure: engineered earthen banks with riprap support, bank slope 1.5:1 to 1:1 in upper reach and lessening to up to 2:1 in lower reach in places.

Water quality (qualitative): similar to Reach 2 upstream, moderate level of turbidity.

Channel processes: The upper reach is similar to Reach 2, supporting a linear fluvial system dominated by dense cattail growth and in-channel sedimentation; in lower reach channel alignment widens and the reach experiences backwatering conditions; these flow conditions are resulting in settling of silts and mud, deposited in broad sediment benches/wedges across the channel that are observed in the lower reach.

Hinebaugh Creek – Reach 1

BIOLOGICAL CONDITIONS

Vegetation composition: scattered riparian woodland on most banks, with some ruderal herbaceous areas.

Riparian corridor and canopy closure: scattered riparian woodland with up to 75% canopy closure across the creek in narrower upper section with no canopy closure in wider lower section; canopy dominated by willows and walnut, many portions of this reach contain emergent wetlands below the ordinary high water mark.

Instream habitat: dense cattails and *Ludwigia* throughout the reach provide little value for instream habitat and may obstruct fish passage and significantly impact key water quality parameters such as dissolved oxygen. Cattails may provide suitable bird habitat for some bird species. According to DFG and SCWA biologist, there is no suitable steelhead rearing habitat in this reach.

Listed species with potential to occur: potential migratory habitat for steelhead, likely habitat for California tiger salamander, potential habitat for western pond turtle.



(c) looking upstream from lower reach; near view is of large sediment deposit that continues along the western channel margin for several thousand feet; this feature is shown in its lower end in photo d; sediment deposit reflects backwatering environment influenced by the Laguna, with sediments settling along the long and even bench/bar feature; note mature Alders anchored at toe of bank position (March 6, 2007).



(d) Lower Reach 5, standing at culvert system at Guerneville Rd. Channel is again choked with cattails and the banks are covered by various ruderal species with sparse tree canopy (Nov. 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Hinebaugh Creek Reach 1 include integrated sediment and cattail removal and willow thinning in the upper reach toward Labath Ave (photo a). Downstream at the “big bend,” sediments and cattails have accumulated in pronounced bars at the inner side of the bend. Further downstream, as the backwatering effect of the Laguna becomes more pronounced, abundant sediment is deposited in a long bench/wedge feature (photos c, d). Sediments along this feature are mostly fines and mud reflecting the lower energy depositional environment indicative of the Laguna setting. Approaches to sediment removal along Reach 1 should consider these differing processes – more fluvial-dominated processes upstream of the “big bend” transitioning to a more stillwater environment downstream of the “big bend”. Hinebaugh Creek Reach 1 also represents an important opportunity in sediment management and removal directly upstream of the impacted Laguna de Santa Rosa aquatic resource. Sediments in storage in Reach 1 will eventually make their way downstream to the Laguna further reducing the Laguna’s capacity and habitat potential. Management and removal of accumulated sediment in Reach 1 provides potential flood management and habitat benefits.



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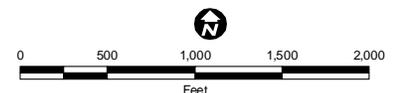
Vegetation Type

- | | | | | | |
|---|--------------------------------------|---|-----------------|---|-------------------------|
|  | Blackberry Scrub |  | Riparian Forest |  | SMP Maintenance Reaches |
|  | Mixed Riparian Scrub |  | Ruderal | | |
|  | Riparian Woodland (full canopy) |  | Willow Scrub | | |
|  | Riparian Woodland (up to 75% canopy) |  | Developed | | |
|  | Riparian Woodland (up to 25% canopy) | | | | |

Sources:
Sonoma County Water Agency
County of Sonoma
AirPhotoUSA, 2005

FIGURE 4-38

Reaches and Vegetation Upper Laguna (8 of 11)



1 inch equals 1,095.078331 feet

Hinebaugh Creek – Reaches 7 & 6

JURISDICTION: Owned by City of Rohnert Park, SCWA maintenance easement for both reaches

LOCATION: Reach 7: Snyder Lane to Crane Creek confluence

Reach 6: downstream of Reach 7 to Country Club Drive

ADJACENT LAND USE: Rohnert Park single family home residential neighborhoods

UPSTREAM: Five, Crane, Hinebaugh creek tributaries

LENGTH: Hinebaugh 7: 1,689 ft.

Hinebaugh 6: 1,093 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:

Hinebaugh 7: 81 ft.

Hinebaugh 6: 120 ft.

AVERAGE TOP-OF-BANK WIDTH:

Hinebaugh 7: 52 ft.

Hinebaugh 6: 52 ft.



(b) Reach 6 downstream of Crane Cr confluence; note trapezoidal channel form, earthen banks on south side and small riprap on north side; very linear and straightened channel, mature vegetation providing shading, blackberry along northern bank (south facing); note increased turbidity due to Crane Creek suspended sediments entering Hinebaugh Creek (Mar 6, 2007).

MAINTENANCE HISTORY



(a) downstream end of Reach 7 looking upstream at confluence with Crane Creek; Hinebaugh 7 reach is to the right (south) of the paved access road; note rocky drop structure in mid-distance and pooling across access road where Hinebaugh and Crane creeks join; Hinebaugh flows are relatively clear compared to Crane Creek flows which are turbid with suspended sediments (Mar 6, 2007).

PHYSICAL CONDITIONS

Reach setting: transition from non-straightened upper sub-basin tributaries to engineered and straightened channel.

Active channel: upper Reach 7, 4-6 ft wide and 1-2 ft deep; channel widens below drop structures at Crane Creek confluence (photo a) to 8-10 ft (photos b, c) and to 15-20 ft further downstream (photo d).

Bed sediments/texture: generally finer materials similar to Five/Crane creek tributaries, with some sands, and cobbles derived from local bank protection.

Bank structure: trapezoidal channel form with banks sloped from 1:1 to 2:1; banks comprised of earthen material and small rip rap (photos a-d); drop structures and access roads at Crane Creek confluence comprised of rock and concrete.

Water quality (qualitative): flows are somewhat turbid with suspended sediments (observed 5 days after storm event); suspended sediment arriving from Five/Crane creek tributaries and not Hinebaugh tributaries which appear clearer (photo a).

Hinebaugh Creek – Reaches 7 & 6

Channel processes: linear channel alignments with flows contained within engineered banks; channel gradient drop occurs mostly through drop structures at Crane Creek confluence resulting in Reach 6 downstream being very gently sloped; sediment bars were not observed to be forming in these reaches.

BIOLOGICAL CONDITIONS

Vegetation composition: these reaches support dense riparian woodland on both sides of the creek, with some ruderal areas. Large red willows and other riparian species dominate reach.

Riparian corridor and canopy closure: 20-50 ft wide corridor on each bank; canopy closure between 0-75%.

Instream habitat: channel conditions appear to be controlled by level of canopy closure; areas with significant closure support open water habitat with limited emergent vegetation, while areas with limited canopy support cattails and other emergent vegetation from bank to bank. Channel has very limited complex and open water sections are straight, shallow, turbid, with no apparent in-channel bars. According to DFG and SCWA biologist, there is no suitable steelhead rearing habitat in this reach.

Listed species with potential to occur: potential migratory habitat for steelhead, potential western pond turtle habitat.



(c) Reach 6 middle zone looking upstream; trapezoidal banks approx 2:1 sloped comprised of small riprap with grass above; channel widening in downstream direction; instream cattail vegetation (Mar 6, 2007).



March 6, 2007



May 29, 2007

(d) Reach 6 terminus looking upstream from Country Club Dr.; very linear channel, channel bed width increases to 15-20 ft wide, gentle gradient throughout lower Reach 6 creates deeper pooling and slower velocities, no strong evidence of in-channel bars forming. Note growth of in-channel willows between March and May of the same year.

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Hinebaugh Creek Reaches 7 and 6 do not show strong evidence of excessive sedimentation or bank stabilization issues. The dominant sediment load in Reach 6 is finer materials delivered mostly from Five Creek and Crane Creek tributaries upstream. Channel slope (though gentle downstream of the drop structures at the Crane Creek confluence) appears to be adequate in passing most of these finer sediments downstream, as in-channel sediment accumulation is not observed in lower Reach 6. As such, Hinebaugh Reach 6 is considered a “transport reach” with materials moving through the system on their way downstream. Similar to observations for Five and Crane creeks, management considerations for Hinebaugh Reach 6 focuses on opportunities to improve erosion control and sediment yields from the upper Five Creek watershed. In terms of vegetation management, repeat field visits indicated significant willow growth in lower Reach 6 between early March and late May 2007.

Hinebaugh Creek – Reaches 5 & 4

JURISDICTION: Both reaches owned by City of Rohnert Park, SCWA maintenance easements

LOCATION: Reach 5: Country Club Drive to State Farm Drive
Reach 4: State Farm Drive to Commerce Boulevard

ADJACENT LAND USE: Reach 5: Residential (single family to north, apartment complexes to south) and golf course in central reach
Reach 4: offices and parking lots to north, offices and multi-unit residential to south

UPSTREAM: Hinebaugh 6

LENGTH: Hinebaugh 5: 2,898 ft.
Hinebaugh 4: 965 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Hinebaugh 5: 161 ft.
Hinebaugh 4: 125 ft.

AVERAGE TOP-OF-BANK WIDTH: Hinebaugh 5: 89 ft.
Hinebaugh 4: 105 ft.



(b) Same view as photo (a), note abundant vegetation growth compared to March, earlier in the season (May 29, 2007).



(a) looking downstream from Country Club Dr.; linear channel with symmetrical cross section and access roads on either side; (March 6, 2007).

PHYSICAL CONDITIONS

Reach setting: very linear channel downstream of Hinebaugh 6 in central Rohnert Park, in alluvial plain geomorphic setting, golf course-maintained grassy channel located between Reach 5 and Reach 4.

Active channel: Reach 5 is 8-14 ft wide and Reach 4 is 14-20 ft wide, depth estimated at approx 1-3 ft.

Bed sediments/texture: generally fine materials similar to Five, Crane, and Hinebaugh creek tributaries upstream, with some sands, and cobbles derived from local bank protection.

Bank structure: symmetrical trapezoidal channel form with banks sloped from 1:1 to 2:1; lower banks drop from bench/access roads 5-7 ft down into active channel; banks comprised of earthen material and rip rap in places.

Water quality (qualitative): flows are somewhat turbid with suspended sediments (observed 5 days after storm event) apparently delivered from upstream reaches.

Channel processes: linear channel alignment with flows contained within engineered banks; channel gradient changes occur mostly at/near key road crossings (Country Club Dr., State Farm Dr.) with gentle gradients between; channel maintained as grassy swale at golf course; sediment bars not observed forming in Reach 5, but are observed in Reach 4 downstream of State Farm Dr. (photo d).

MAINTENANCE HISTORY

Hinebaugh Creek – Reaches 5 & 4

BIOLOGICAL CONDITIONS

Vegetation composition: primarily riparian woodland some areas of willow scrub and ruderal vegetation.

Riparian corridor and canopy closure: 0-50 ft wide corridor on each bank; canopy closure between 0%-75%.

Instream habitat: channel provides limited complexity and is generally straight with no low flow channel; where canopy closure is higher, water temperatures may be lower and shade provides some cover. According to DFG and SCWA biologist, there is no suitable steelhead rearing habitat in this reach; summer vegetation provides bird habitat.

Listed species with potential to occur: potential migratory habitat for steelhead, likely habitat for California tiger salamander, potential habitat for western pond turtle.



March 6, 2007



March 6, 2007



May 29, 2007



May 29, 2007

(c) Looking downstream of railroad crossing; some in channel sedimentation observed, exacerbated by rapid in-channel willow growth happening during spring months.

(d) Looking downstream of State Farm Dr.; sediment is observed accumulating in bars and bank adjacent wedges; note prominent cattail and willow growth during spring months essentially blocking channel.

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Hinebaugh Creek Reaches 5 and 4 focus on thinning of existing willows and removal of cattails. In Reach 5 new willow growth along toe of bank expands into the active channel during the spring and summer months. This willow growth requires routine thinning to prevent excessive channel roughness (photos a, b). Further downstream into Reach 4, the presence of in-channel cattails increases, as does the presence of mid-channel sediment bars and sediment wedges along the toe of the bank. Maintenance of Reach 4 includes consideration of integrated cattail and sediment removal. In terms of opportunities, Reaches 5 and 4 benefit from access roads to either side of the channel, which provides good top of bank access for vegetation thinning work. Uncertain whether nutrients, fertilizers, etc. from the golf course are being delivered directly to Hinebaugh Creek where it passes through course, but it seems likely to be the case.

Crane Creek – Reaches 2 & 1

JURISDICTION: Crane 2: Owned by City of Rohnert Park, SCWA maintenance easement
Crane 1: SCWA owned and maintained, located in City of Rohnert Park

LOCATION: Crane 2: Snyder Lane to confluence with Five Cr and Crane 1
Crane 1: Downstream of Crane 2 to Hinebaugh Cr confluence

ADJACENT LAND USE: Single family residential

UPSTREAM: Five Creek and Crane Creek tributaries

LENGTH: Crane 2: 1,085 ft.
Crane 1: 1,827 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Crane 2: 99 ft.
Crane 1: 89 ft.

AVERAGE TOP-OF-BANK WIDTH: Crane 2: 70 ft.
Crane 1: 85 ft.



(b) Reach 1 at the confluence of Crane Creek Reach 2 and Five Creek; note cattail vegetation and dramatic increase of fine sediments arriving from Five Creek tributary (March 6, 2007).

MAINTENANCE HISTORY



(a) Reach 2 looking downstream from Snyder Ln crossing; note coarser load and clearer water than Five Creek tributary nearby to the north (March 6, 2007).

PHYSICAL CONDITIONS

Reach setting: Crane Creek Reaches 2 and 1 are a transition between the non-engineered Crane Creek tributaries upstream to the more linear and engineered Hinebaugh Creek system downstream.

Active channel: Reach 2, 2-6 ft wide and 6-12" deep (photo a); Reach 1 widens to 10 ft (photos b, c) and deepens to over 1 ft downstream of Five Creek confluence. Note the presence of an erosive channel knickpoint (1 ft drop in channel elevation), an unusual feature that appears to be eroded out of cohesive and hardened bed sediments.

Bed sediments/texture: Reach 2 has sand and cobbles derived from local bank protection (photo a); Reach 1 is finer textured with silts/clays and more similar to Five Creek.

Bank structure: Reach 2 is a narrow channel with moderately steep banks comprised of earth, rock and small rip rap (photo a); Reach 1 has earthen banks comprised of finer sands, silts, and clay (photo c); upper Reach 1 has steeper banks (photo b), with lower Reach 1 having gentler banks (photo c) similar to Five Creek tributary upstream.

Water quality (qualitative): Reach 2 appears clear while Reach 1 is noticeably turbid with suspended sediments downstream of Five Creek confluence (photo c); downstream at Hinebaugh Creek confluence, Hinebaugh 7

Crane Creek – Reaches 2 & 1

tributary joins with clearer water and turbidity decreases (photo d).

Channel processes: Reach 2 carries suspended sediment during low velocities. Reach 1 is

similar to the Five Creek tributary, and appears largely shallow with annual magnitude events flowing over bank onto adjacent benches, depositing fine sediments on those benches.

BIOLOGICAL CONDITIONS

Vegetation composition: primarily composed of riparian woodland with 25-75% canopy closure across the creek, mix of willows and other riparian species, some areas of emergent wetland in the creek.

Riparian corridor and canopy closure: wide corridor on each bank; canopy closure between 25%-75%.

Instream habitat: Reach 2 appears somewhat incised with the low flow channel re-creating sinuosity between the banks. Reach 2 provides some channel complexity with riffle-pool sequences and occasional woody debris, giving way to Reach 1 that is more impacted by sediment, straighter, with reduced habitat value. Arroyo willows provide some shade to the active channel.

Listed species with potential to occur: Reaches 2 and 1 are potential migratory corridors for steelhead and potential habitat for western pond turtle. Reach 2 is potential habitat for California red-legged frog and known habitat for foothill yellow-legged frog.



(c) Reach 1 looking downstream at mid-reach; note muddy gently sloped banks and increased turbidity and fine sediment arriving from Five Creek tributary; it appears that flows went overbank earlier in the season and spread across the cross section, some instream cattail vegetation and willows along banks (March 6, 2007).



(d) Reach 1 looking upstream at Hinebaugh Creek confluence; flows spread across into wide pool due to damming effect of in-channel facility and concrete access ramps (March 6, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Crane Creek Reaches 2 and 1 focus on opportunities to enhance water quality. Similar to Five Creek Reach 1, Crane Creek Reach 1 has a high degree of fine sediment deposition. Apart from routine SMP monitoring activities to ensure adequate conveyance capacity, this reach (like Five Creek Reach 1) would benefit from an investigation of headwater areas to identify if the fine sediments observed are originating from throughout the upper watershed, or if perhaps they are delivered from a more limited source either due to a geologic process (landslide or slump) or perhaps a land use influence (e.g., mine, agricultural erosion). This reach provides an excellent opportunity to seek headwater erosion control solutions. Additionally, the knickpoint feature on Crane Creek Reach 1 should be monitored to check for further upstream migration or deeper incision. It is believed that this feature represents a base-level grade adjustment following the development of the engineered facilities at the Hinebaugh Creek confluence.

Five Creek – Reach 1

JURISDICTION: SCWA owned and maintained, located in City of Rohnert Park

LOCATION: Snyder Lane to confluence with Crane Creek

ADJACENT LAND USE: Single family residential

UPSTREAM: Five Creek alluvial fan and headwaters, non owned and maintained reaches

LENGTH: 2,585 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 119 ft

AVERAGE TOP-OF-BANK WIDTH: 110 ft



(b) looking downstream from Snyder Lane crossing; note broad/flat cross-section, shallow channel, dominated by fine sands, silts, mud; overbank flows overtop gentle bank slope; wide easement (March 6, 2007).

MAINTENANCE HISTORY



(a) looking upstream of Reach 1 from the Snyder Lane crossing; note high turbidity, fine sediments dominate bed and bank (March 6, 2007).

PHYSICAL CONDITIONS

Reach setting: Five Creek is a northern tributary to Hinebaugh Creek; upstream of Reach 1 turbid flows carry fine sediments toward Reach 1 (photo a).

Active channel: open water channel 6-10 ft wide and 6-12" deep; filled with cattail and other vegetation in locations (photo c).

Bed sediments/texture: fine sands, silts and mud; fines trapped by cattails (photo c).

Bank structure: shallow and flat earthen banks (photo b) with increasing definition by willow vegetation moving downstream (photos c, d).

Water quality (qualitative): relatively high turbidity and suspended sediments concentrations were observed in both flowing and stagnant sections during spring 2007.

Channel processes: shallow channel results in annual overbank flows that spread across to adjacent benches, depositing fine sediments on those benches and further out into the easement cross-section; fine sediments are carried in suspension even during low velocities.

Five Creek – Reach 1

BIOLOGICAL CONDITIONS

Vegetation composition: most of this creek has a well-developed riparian woodland corridor dominated by alders and willows.

Riparian corridor and canopy closure: 40-60 ft. wide corridor on each bank; canopy closure between 25%-75%.

Instream habitat: wide channel with heavy accumulation of fine sediments and no low-flow channel; provides little habitat value due to lack of complexity and extremely high levels of turbidity. Where shade is lacking the active channel supports considerable cattail growth resulting in a shallow and diffuse low flow condition. Due to existing riparian canopy, this channel may provide suitable habitat for migratory birds.

Listed species with potential to occur: potential habitat for western pond turtle.



(c) mid-reach downstream from photo (b); willows grow along banks while cattails and other instream vegetation occupy south facing channel that has little shade (March 6, 2007).



(d) looking downstream toward Crane Creek confluence; similar conditions as upstream, fine channel sediments, evidence of overbank flows depositing sediment on benches to either side of channel, instream cattails and other vegetation, some willows along banks (March 6, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Five Creek Reach 1 are focused on the prevalence of fine sediments transporting through and depositing in this reach. This reach has a higher degree of fine sediment deposition and transport (even in low velocity flows) than any other reach observed in the Rohnert Park area. Apart from routine SMP monitoring activities to ensure adequate conveyance capacity, this reach would benefit from an investigation of headwater areas to identify if the fine sediments observed are originating from throughout the upper watershed, or if perhaps they are delivered from a more limited source either due to a geologic process (landslide or slump) or maybe a land use influence. This reach provides an excellent opportunity to seek headwater erosion control solutions.



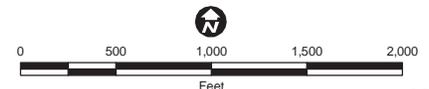
Vegetation Type

- Blackberry Scrub
- Mixed Riparian Scrub
- Riparian Woodland (full canopy)
- Riparian Woodland (up to 75% canopy)
- Riparian Woodland (up to 25% canopy)
- Riparian Forest
- Ruderal
- Willow Scrub
- Developed
- SMP Maintenance Reaches

Sources:
Sonoma County Water Agency
County of Sonoma
AirPhotoUSA, 2005

FIGURE 4-39

Reaches and Vegetation Upper Laguna (9 of 11)



1 inch equals 1,000 feet

Upper Laguna – Reach 3 and Washoe Creek – Reach 1

JURISDICTION: Owned and maintained by SCWA, located in the City of Cotati

LOCATION: Highway 101 to confluence with Copeland Creek (at Copeland Reach 1)

ADJACENT LAND USE: Commercial and light industrial land uses to north, low density commercial and agriculture to south

UPSTREAM: Upper Laguna Reach 4

LENGTH: Laguna 3: 3,707 ft
Washoe 1: 1,352 ft

CHANNEL EASEMENT CORRIDOR WIDTH:
Laguna 3: 116 ft
Washoe 1: 66 ft

AVERAGE TOP-OF-BANK WIDTH: Laguna 3: 87 ft
Washoe 1: 75 ft



(b) Mid-reach looking downstream; gentle sloped grass covered upper banks; willows growing on the lower bench toward the active channel (May 29, 2007).

MAINTENANCE HISTORY



(a) Upper reach looking downstream from Redwood Dr.; mature willows on upper banks provide some limited shade but most of reach is sunny (May 29, 2007).

PHYSICAL CONDITIONS

Reach setting: upper Laguna channel system, trapezoidal channel, gentle banks with wide lower bench adjacent to channel, little shading.

Active channel: channel bed is 12-16 ft wide; late spring flows generally over 1 ft deep, with pools 2-3 ft deep.

Bed sediments/texture: generally finer textured sediments of silts and some sands seen around the deeper pools.

Bank/bed structure: trapezoidal channel with earthen banks sloped from 2:1 to 1:1; some sections have wide benches adjacent to low flow channel (photo b); some sections have deeper inset low flow channel (photo c).

Water quality (qualitative): generally clear flows, clearer than upstream reaches, pools along southern bank in shade of willows provide cool water refuge.

Channel processes: sections without cattail blockages flow freely; where the bench adjacent to active channel is wide it provides a depositional area for higher flows that overtop the lower set main channel (photos b, d).

Upper Laguna – Reach 3 and Washoe Creek – Reach 1

BIOLOGICAL CONDITIONS

Vegetation composition: Primarily open ruderal grassland on banks with some sections of riparian woodland and mixed riparian scrub on the banks.

Riparian corridor and canopy closure: In some sections of these reaches, emergent vegetation entirely or partially fills the channel. Some small regions of riparian woodland have up to 75% canopy closure but these are infrequent.

Instream habitat: Dominated by diffuse flow through abundant emergent vegetation that stretches from bank to bank limiting instream habitat quality. Isolated stretches are generally in areas with some canopy and willow along the toe of slope appear to be supporting pool development.

Listed species with potential to occur: Laguna 3 is known migratory habitat for steelhead and potential habitat for western pond turtle and listed plants. Washoe 1 is potential habitat for western pond turtle.



(c) Mid-reach looking downstream; well defined channel with deep pools (up to 3 ft deep under low flow conditions); grassy banks 1:1 to 2:1 sloped (May 29, 2007).



(e) Washoe Creek looking downstream toward confluence with Upper Laguna Reach 3; wide channel alignment, gentle sloped banks, wide flat central channel covered with emergent vegetation, no shade (May 29, 2007).



(d) Lower reach toward Washoe Creek confluence; abundant cattails throughout sunny channel section, sediments collect and deposit among cattails in lower reach (May 29, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

In Upper Laguna Reach 3 and Washoe Reach 1, management considerations focus on opportunities to provide more shade along the channel. Copeland Creek Reach 1 nearby and Laguna Reach 2 just downstream both have far more bank vegetation, which effectively shades the channel and limits cattail growth. These nearby reaches provide good reference examples of how a planting program at Laguna Reach 3 could provide several benefits. Cattail development in the lower section of the reach should be monitored for excessive growth as well as sedimentation occurring within the cattails (photo d). Washoe Creek Reach 1 is a simple trapezoidal channel broad and flat in cross section with emergent vegetation growing throughout the bed (photo e).

Upper Laguna – Reach 2

JURISDICTION: Owned and maintained by SCWA, located west of the City of Cotati

LOCATION: Copeland Creek/Washoe Creek confluence with Upper Laguna channel downstream to Stony Point Road

ADJACENT LAND USE: Agriculture to south; trailer park, commercial areas, and Rohnert Park Expressway to north

UPSTREAM: Upper Laguna Reach 3, Copeland Creek Reach 1, and Washoe Creek Reach 1

LENGTH: 6,577 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 176 ft

AVERAGE TOP-OF-BANK WIDTH: 159 ft



(b) Mid Reach 2 near Gossage Creek confluence: mature trees provide ample shade to channels; toe of slope sediment bars, seen in center right with willow vegetation provide habitat, in-channel complexity, and sinuosity; steep bank to right near vertical.

MAINTENANCE HISTORY



(a) Upper Reach 2 looking downstream; note wider channel than upstream reaches, mix of streambank vegetation, and developing canopy that provides shade to creek.

PHYSICAL CONDITIONS

Reach setting: transitional reach from more riverine upper Laguna channels to the more “lagoonal” sections of the Laguna downstream; lower Reach 2 strongly experiences bi-directional flow and backwater effects of the Laguna; Reach 2 is the hub of several key confluences of the upper watershed including Copeland, Washoe, Gossage, and Hinebaugh Creeks, and the Bellevue-Wilfred Channel.

Active channel: upper reach channel bed is 10-20 ft wide, late spring flows generally over 1 ft deep with pools 2-3 ft deep (photos a, b); lower reach channel widens to 80 ft in true “Laguna” setting near Stony Point Rd bridge (photos c, d, e).

Bed sediments/texture: generally finer textured sediments of silts and some sands seen around the deeper pools of the upper reach transitioning to muddier environment in lower reach.

Bank structure: in upper reach, trapezoidal channel with earthen banks sloped from 2:1 to 1:1, some sections with toe of bank bars (photo b) or benches adjacent to low flow channel; in lower reach main channel sits in wide channel cross section with access roads and higher levees to south and north (along Rohnert Park Expressway).

Water quality (qualitative): generally clear flows (photo b), clearer than upstream reaches,

Upper Laguna – Reach 2

shaded pools provide cooler temperature waters.

Laguna-type environment as described above.

Channel processes: Upper Reach 2 has increased channel complexity, sinuosity, and shading than the open and grassy Reach 3 upstream; Lower Reach 2 is stillwater

BIOLOGICAL CONDITIONS

Vegetation composition: Riparian woodland with canopy coverage across channel in upper stretch of this reach, lower reach the channel is much wider with woodland along creek but no canopy closure.

Riparian corridor and canopy closure: Canopy closure around 75% or greater in upper reach, no canopy closure in lower reach. Some of the lower creek is overgrown with Ludwigia.

Instream habitat: Upper reach shows some sinuosity and stream complexity with pools formed by bars and/or woody debris, lower reach exhibits classic lagoon habitat with a shallow, broad, and mostly uniform channel and high turbidity. Ludwigia appears to be impacting open water habitat and potentially causing deleterious effects on dissolved oxygen.

Listed species with potential to occur: known migratory habitat for steelhead, potential habitat for western pond turtle and listed plants.



(c) Lower Reach 2 downstream of Gossage Creek confluence, looking upstream; very wide channel cross section compared to upstream; note Ludwigia growing in-channel (and continues up into Gossage Creek).



(d) Lower Reach 2 looking upstream from Stony Point Road crossing; confluence of Bellevue-Wilfred channel seen to far left; now in Laguna setting, wide channel with lower velocity flows that backwater up into system.

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

The upper and lower sections of Upper Laguna Reach 2 have very different characteristics. The upper reach (photos a, b) exhibits riverine qualities, providing a channel with moderate geomorphic complexity with a well developed canopy in several places that provides near complete channel shading. There are some minor channel constrictions in the upper reach where in-channel deposits pinch the channel. These don't appear overly problematic to date, but can be monitored. The lower section of Reach 2 emerges as the "true laguna" downstream of Gossage Creek, with a very wide channel cross section (photos c, d) and channel forms indicative of backwatering bi-directional flows. The key management consideration for Reach 2 is the continued management, removal, and monitoring of Ludwigia vegetation near the Gossage Creek confluence.

Copeland Creek – Reach 1

JURISDICTION: SCWA owned and maintained, located in Rohnert Park

LOCATION: Highway 101 to Laguna Channel confluence

ADJACENT LAND USE: Residential trailer park to north and commercial buildings to south

UPSTREAM: Copeland 2

LENGTH: 2,851 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 105 ft

AVERAGE TOP-OF-BANK WIDTH: 54 ft



(b) Mid Reach 1 looking downstream channel beneath shade of willow in lower right (May 29, 2007).

MAINTENANCE HISTORY



(a) Reach 1 looking downstream from Redwood Dr; cattails grow in non-shaded channel portion just downstream of the Hwy 101 crossing (May 29, 2007).

PHYSICAL CONDITIONS

Reach setting: lowest Copeland Creek reach, between Hwy 101 and Upper Laguna, in lower alluvial plain, linear channel with increasing channel incision towards its lower end.

Active channel: linear throughout, 8-10 ft wide

Bed sediments/texture: in upper/mid reach small bars and sediment wedges forming at toe of bank comprised of sands/silts; small sand bars in channel in lower reach (photos c, d).

Bank structure: upper and mid reach has earthen banks 4-6 ft high (2:1 or 1.5:1); in the lower reach, the bank on south side heightens and steepens (photo c) as channel incises deeper beneath banks.

Water quality: debris and trash collect just downstream of Hwy 101 crossing.

Channel processes: upper and mid reach exhibits some mild deposition, including immediately downstream of the Hwy 101 crossing where cattails, sediment, and debris/trash can accumulate; in lower reach channel has downcut, most likely due to elevation/gradient adjustments towards the Laguna 3 confluence (photos c, d).

Copeland Creek – Reach 1

BIOLOGICAL CONDITIONS

Vegetation Composition: Canopy closure is 25-50%, increasing downstream as the channel narrows and deepens. At breaks in the canopy, cattails grow in isolated patches on bars.

Riparian Corridor: A band of willows (native Arroyo willows and non-native weeping willows) grows along the toe of the slope throughout most of reach. A fringe of emergent wetland vegetation is adjacent to willows, with rice cutgrass, watercress, and patches of cattails. A mixture of native and non-native trees are at top of bank and along access road, including coast live oak and Monterey pine. Upper banks support shrubby vegetation dominated by non-natives such as Himalayan blackberry and cotoneaster, with ruderal herbaceous vegetation dominated by Harding grass interspersed.

Instream Habitat: Reach includes some riffles/run sequences between shallow sand bars. Willows provides for additional habitat complexity through rootwads along lower banks. Willows also provide good shade of channel (photo b) in locations.

Listed species with potential to occur: known steelhead occurrence (reach is a migration corridor); potential habitat for western pond turtle.



(c) lower Reach 1 (near confluence with Laguna 3 and Washoe 1 reaches) looking upstream; note steep eroding bank on right and overall depth from top-of-bank; channel has incised in its lower zone to adjust for elevations at Laguna channel confluence (May 29, 2007).



(d) Lower Reach 1 (just upstream of Laguna 3 confluence) looking downstream (May 29, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for the upper section of Copeland Creek Reach 1 focus on monitoring cattail growth downstream of the Hwy 101 crossing. This area downstream of the Hwy 101 crossing also collects debris and trash that will likely need periodic removal. In the mid reach area, willow vegetation provides nice canopy shading over channel, but will need to be monitored if willow growth in the channel becomes excessive. For now, the willow growth is mostly on the banks and does not require much maintenance. In the lower reach, bank erosion along the south banks near the Laguna 3 channel confluence should be monitored (photo c). If the bank erosion were to become worse and impact the access road, then bank stabilization/repair activities may be required.

Gossage Creek – Reach 3

JURISDICTION: Owned and maintained by SCWA, located west of the cities of Cotati and Rohnert Park

LOCATION: Upstream of Stony Point Road to Gravenstein Highway

ADJACENT LAND USE: Agriculture to north; truck/transfer facility to south

UPSTREAM: Non engineered Gossage Creek tributary

LENGTH: 1,093 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 114 ft

AVERAGE TOP-OF-BANK WIDTH: 73 ft



(a) Upper Gossage Creek Reach 2 looking downstream; note slumping bank to right (difficult to see beneath grass) which has undercut access road for 75 ft; willow and abundant cattails in channel with algae developing in stagnant water behind cattails (May 29, 2007).



(b) Same view as photo (a) following bank reconstruction; note gentle slope to new bank and vegetation plantings not yet visible beneath matting (late June 2007).

MAINTENANCE HISTORY

PHYSICAL CONDITIONS

Reach setting: the beginning of engineered Gossage Creek, downstream of its natural tributary system upstream of Gravenstein Highway; reach is wider and more linear than upstream, which has a narrow and more sinuous channel.

Active channel: 16-20 ft wide, 1-2 ft deep.

Bed sediments/texture: silt and fine sand, mud in stagnant pools behind cattails.

Bank structure: trapezoidal engineered channel with mix of earthen banks (photo a) for most of reach, with rock banks at bank reconstruction site (photo b) and culvert outfalls.

Water quality (qualitative): algae developing in stagnant areas (photos a, b).

Channel processes: bank slumping along lower reach and sedimentation in mid-channel upstream of Stony Point Road crossing (photo c).

Gossage Creek – Reach 3

BIOLOGICAL CONDITIONS

Vegetation composition: Riparian woodland and ruderal grassland along the banks; emergent wetland within the creek channel.

Riparian corridor and canopy closure: Riparian woodland has 25 to 75% canopy closure across the creek, and many open areas with no canopy closure; the riparian corridor is filled in with emergent wetland vegetation for essentially 100% of the channel.

Instream habitat: Aquatic habitat is compromised by emergent vegetation spanning most of the channel. Some pools and low flow channel persist, but become stagnant and full of algae by late spring. Channel is generally straight with limited complexity and high turbidity.

Listed species with potential to occur: moderate to highly likely habitat for California tiger salamander, potential habitat for western pond turtle.



(c) Looking upstream from the Stony Point Road crossing, note slumping and erosion along banks to left (in shadows), recent deposition from winter storm events (center right), and few visible cattails beneath water and sediment. Compare with photo (d) (February 15, 2006).



(d) Same view as (c) taken in May 2007; note rapid growth of cattails, blackberries, and willows throughout channel (May 29, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Gossage Creek Reach 3 focus on cattail removal throughout the reach and monitoring bank stability in the section just upstream of the Stony Point Road crossing (photo c). Bank slumping near Stony Point Road is not as severe as the condition upstream where the bank reconstruction project occurred (photo b) but does warrant monitoring and observation. Sediment accumulating upstream of Stony Point Road crossing, seen in center-right of photo (c), should also be monitored for on-going accumulation and potential need for removal.

Gossage Creek – Reaches 2 & 1

JURISDICTION: Owned and maintained by SCWA, located west of the cities of Cotati and Rohnert Park

LOCATION: Stony Point Road to confluence with Upper Laguna Reach 2

ADJACENT LAND USE: Agriculture and low density rural residential

UPSTREAM: Gossage Creek Reach 3

LENGTH: Gossage 2: 3,957 ft.
Gossage 1: 2,641 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:

Gossage 2: 116 ft.

Gossage 1: 98 ft.

AVERAGE TOP-OF-BANK WIDTH: Gossage 2: 70 ft.

Gossage 1: 66 ft.



(b) Mid Reach 2 looking downstream; channel deepens against higher banks (generally sloped 1:1); abundant cattail growth continues along non-shaded reach; cattails clog low flow channel; access road seen above bank to right; adjacent land use is rural (Mar 29, 2007).

MAINTENANCE HISTORY



(a) Upper Reach 2 looking upstream; abundant cattails fill channel bed, flow occurs diffusely through micro channels between cattails; some trees recently planted along south bank (left) to provide shading; banks are mostly rock riprap (Mar 29, 2007).

PHYSICAL CONDITIONS

Reach setting: continued engineered channel from Gossage Reach 3 upstream, though Reaches 2 and 1 are more trapezoidal with more rocked banks than Reach 3; lower end of Reach 1 meets Upper Laguna Reach 2 at key confluence of system.

Active channel: 16-20 ft wide, 1-2 ft deep, 3-4 ft deep at large pool near Derby Lane.

Bed sediments/texture: silt and fine sand, mud in stagnant pools behind cattails.

Bank/bed structure: trapezoidal engineered channel with mix of earthen banks and rock banks (photo a); bank slopes are steep 1:1 or less (photos b, d); channel cross section deepens in downstream direction toward confluence with the Laguna, compare photo (a) and (d) for depth of channel cross section increasing from 5-6 ft to 10-14 ft.

Water quality (qualitative): abundant cattail and Ludwigia choke channels and increase stagnation; note tributary arriving from near Derby Lane without any cattails and stronger low flow velocities which run very clear.

Gossage Creek – Reaches 2 & 1

BIOLOGICAL CONDITIONS

Vegetation composition: Ruderal grassland along creek; in upper part of reach, some riparian woodland dominated by a mix of valley oak and black walnut, varies from 0 to 25% canopy coverage across creek. Emergent vegetation fills the creek channel.

Riparian corridor and canopy closure: Relatively open canopy along channel, with areas of tall tree growth along some portions of reach. Channel is overgrown with emergent vegetation for 95% of its area, primarily cattails in the upper part of the reach and Ludwigia sp. in the lower part of the reach.

Instream habitat: Aquatic habitat is compromised by emergent vegetation, primarily cattails in upper section and Ludwigia in lower section, across the entire active channel. Channel is generally trapezoidal with limited complexity with sediment deposition across the channel bed. Flow is generally shallow and diffuse through vegetation.

Listed species with potential to occur: likely habitat for California tiger salamander, potential habitat for western pond turtle.



(c) Mid Reach 1 looking upstream; invasive Ludwigia is widespread across channel except for small pockets of cattails (Mar 29, 2007).



(d) Lower Reach 1 looking downstream to confluence with Laguna Channel Reach 2; channel continues to deepen relative to banks approaching grade level at Laguna confluence; Ludwigia seen invading from Laguna and progressing upstream (Mar 29, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Gossage Creek Reaches 2 and 1 focus on in-channel vegetation removal throughout the reach. In the upper reach abundant cattails are blocking flows and trapping fine sediments (photos a and b). In the lower reach invasive Ludwigia is progressing upstream from the Laguna. Other opportunities to reduce cattail and Ludwigia presence include on-going tree planting on banks to encourage shading and a canopy cover. A useful reference reach for such canopy development is seen just upstream at Upper Laguna Reach 2, where the beneficial influence of shading is observed. In that location, Ludwigia progresses from the Laguna south up the sunny and unshaded Gossage Creek tributary rather than progressing further upstream along the mainstem Laguna Reach 2 channel where Ludwigia does not occur beneath the shaded canopy. An eroding stream bank in the mid section of Gossage Reach 2 is threatening the access road and will likely become increasingly erosive if not treated. The bank stabilization approach used at Gossage Creek Reach 3 in 2006 can be used to treat this bank issue.



Vegetation Type

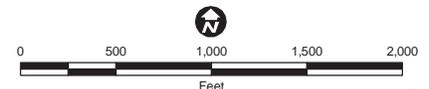
- Blackberry Scrub
- Mixed Riparian Scrub
- Riparian Woodland (full canopy)
- Riparian Woodland (up to 75% canopy)
- Riparian Woodland (up to 25% canopy)

- Riparian Forest
- Ruderal
- Willow Scrub
- Developed

SMP Maintenance Reaches

Sources:
Sonoma County Water Agency
County of Sonoma
AirPhotoUSA, 2005

FIGURE 4-40
Reaches and Vegetation
Upper Laguna (10 of 11)



1 inch equals 1,000 feet

Copeland Creek – Reach 5

JURISDICTION: City of Rohnert Park owner, SCWA maintenance easement

LOCATION: Rohnert Park, Snyder Ln Bridge to 1500 ft upstream

ADJACENT LAND USE: Residential to the north, recreational/school to the south

UPSTREAM: Copeland 6 (not actively managed); Past SCWA Copeland Creek Restoration Project above Petaluma Hill Road

LENGTH: 1,368 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 77 ft

AVERAGE TOP-OF-BANK WIDTH: 89 ft



(b) Mid Reach 5 looking upstream; channel sinuosity increases with presence of “D-shaped” bar features adjacent to inner bend of channel (March 6, 2007).

MAINTENANCE HISTORY



(a) Reach 5 looking upstream; note pool-riffle sequence with cobble bar in foreground and distance (March 6, 2007).

PHYSICAL CONDITIONS

Reach setting: transitional reach between the steeper alluvial fan areas upstream to more gentle gradient alluvial plain setting below Snyder Lane.

Active channel: 8-10 ft wide in upper reach (photo a) increasing to approx 20 ft wide at Snyder crossing (photos b, c, d), average flow depth 6-12 in.

Bed sediments/texture: upper reach dominated by small cobbles (photo a), pebbles, coarse sands; sediments fine toward Snyder Bridge to medium/fine sands and silts.

Bank structure: earthen banks 2:1 to 1:1 (5-8 ft high) in upper reach, less steep and shallower banks in lower reach, no apparent bank stabilization issues.

Channel processes: riffle-pool sequences in upper reach (photo a), depositional bars adjacent to the bank increase toward lower reach (photos b, c), aggradation and widening of mid-channel bars upstream of Snyder Bridge (photo d).

Copeland Creek – Reach 5

BIOLOGICAL CONDITIONS

Vegetation Composition: mapping from 2006-2007 indicates 75% canopy closure for narrow 10-foot wide channel sections, 25-50% canopy closure for 20-ft wide sections.

Riparian Corridor: 20-30 ft wide on each bank; dominated by mature trees with dense blackberry understory (photo a); toe of slope supports dense stands of willow; bank shade, lack of fines, shallow depths result in limited emergent vegetation (photo c).

Instream Habitat: upper reach has low sinuosity, long shallow runs/glides, occasional riffles and pools; transition to lower reach has “D-shaped” cobble bars (photos b, c) at channel bends related to channel bends and mild sinuosity; further downstream more mid-channel bar aggradation occurs (photo d).

Listed species with potential to occur: Considered the best viable steelhead tributary in the Rohnert Park area. Known occurrence of steelhead, reach is migration corridor with known or potential rearing habitat; potential habitat for western pond turtle and foothill yellow-legged frog.



(c) Mid Reach 5 looking downstream, similar to (photo b) cobble bars run along inner channel bend, and mid channel riffle sequence (March 6, 2007).



(d) Reach 5 looking upstream from Snyder Lane crossing, multiple in channel bar features and fine sediments indicate increased depositional environment towards bridge (March 6, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Due to general channel gradient, excessive deposition is not problematic through reach. Bars that are adjacent to bends in the channel in the mid-to-lower reach provide valuable bar-riffle-pool habitats. D-shaped bars reflect increased channel sinuosity in mid-reach, and do not appear to significantly reduce channel capacity. In lower Reach 5, 300 ft directly upstream of Snyder crossing, a more depositional environment emerges with larger and more prominent mid channel bar features (d), general deposition across the channel cross-section, and increased presence of fine sediments. Increased deposition is related to slope reduction and channel transition toward the Snyder Lane crossing.

The lower section of the reach near the Snyder crossing may need occasional sediment removal through its cross-section based on observed depositional bars. Key management opportunity at the lower reach is to maintain and mimic (where possible) the current sequence of elongate mid-channel bars, but simply skim the tops of the bars leaving the root of the bar in place. Keeping these channel forms and flow processes in place supports in-stream habitats. Additionally, removal of dense blackberry understory and limbing of dense willows in upper reach can maintain channel capacity and improve habitat.

Copeland Creek – Reach 4

JURISDICTION: City of Rohnert Park owner, SCWA maintenance easement

LOCATION: Snyder Lane to Country Club Dr

ADJACENT LAND USE: Primarily residential to north and south, community center to north by Snyder Ln

UPSTREAM: Copeland 5

LENGTH: 2,769 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 136 ft

AVERAGE TOP-OF-BANK WIDTH: 86 ft



(b) Mid Reach 4 looking upstream from footbridge; multiple individual bars transitioning to sediment wedge across entire channel bed (March 6, 2007).



(a) Top of Reach 4 looking downstream from Snyder Ln; abundant deposition in multiple bars with finer sediments than Reach 5 (March 6, 2007).

PHYSICAL CONDITIONS

Reach setting: depositional reach, multiple mid-channel bars in upper reach transition to a continuous wedge of sediment that fills the entire channel bed width, overall channel width doubles in size from Reach 5 upstream, to about 40 ft.

Active channel: in upper reach, multiple low flow channels (~6 ft wide) pass around individual sediment bars, in lower reach, channel is diffuse, shallow (<6") and spread across in-channel sediment wedge (photos c, d).

Bed sediments/texture: upper reach dominated by sands and silts, large sediment wedge in lower reach shows fines at surface, but is likely coarser with sands/gravels below.

Bank structure: earthen banks 2:1 to 1:1 (4-6 ft high), no apparent bank stabilization issues

Channel processes: deposition and channel infilling occurs in multiple bars in the upper reach and more homogenous wedge in the lower reach, positive feedback cycle with cattails capturing fine sediments leading to the formation of bars/wedges.

MAINTENANCE HISTORY

Copeland Creek – Reach 4

BIOLOGICAL CONDITIONS

Vegetation Composition: depositional wedge supports dense cattails in approximately 90% of the channel, canopy closure generally 25% or less.

Riparian Corridor: confined to narrow band of willows (arroyo and weeping) growing along toe of bank slope.

Instream Habitat: some channel sinuosity around multiple bars of upper reach, with small pools to side of bars, gives way to homogeneous sediment wedge w/cattails in lower reach. Cattail density may provide good bird habitat but is poorer in-channel aquatic habitat.

Listed species with potential to occur: Considered the best viable steelhead tributary in the Rohnert Park area. Known occurrence of steelhead (reach is a migration corridor); potential habitat for western pond turtle.



(c) Mid Reach 4 looking downstream from foot bridge: similar to photo (b) sedimentation now occurs as broad wedge across entire channel bed, dense cattails on bars trapping more fine sediment (March 6, 2007).



(d) Bottom of Reach 4 looking upstream from Country Club Dr, similar to photo (c) wedge of sediment across entire channel bed, abundant vegetation trapping more fine sediment (March 6, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

The primary management issues in this reach are abundant sediment deposition and in-channel vegetation (cattails), which are collectively impairing the flow conveyance capacity and ecologic functioning of this reach. Sediment removal methods can increase flow conveyance while also improving in-channel habitat through creating a more defined and sinuous low-flow channel and bar sequence as appropriate for this reach. This reach has a thin riparian canopy with limited channel shading. Planting of more woody riparian species along the top of bank and along the toe of slope could both improve shading and inhibit cattail development. Additionally, the watershed projects upstream could identify and treat upstream sediment through erosion control and land-use treatments.

Copeland Creek – Reach 3

JURISDICTION: City of Rohnert Park owner,
SCWA maintenance easement

LOCATION: Country Club Drive to Seed Farm
Drive

ADJACENT LAND USE: Residential to north and
south

UPSTREAM: Copeland 4

LENGTH: 926 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 142 ft

AVERAGE TOP-OF-BANK WIDTH: 83 ft



(a) Upper Reach 3 looking upstream to Country Club Dr. (March 6, 2007).



(b) Mid Reach 3 looking downstream (March 6, 2007).

MAINTENANCE HISTORY

PHYSICAL CONDITIONS

Reach setting: short reach between road crossings, well defined low-flow channel with higher depositional benches to either side of the channel.

Active channel: single low flow channel (6-8 ft wide) excavated to 1-4 ft depth (photo a).

Bed sediments/texture: low flow channel has fine sands and silts, benches to either side comprised of medium sands mostly, likely coarser material at depth, in March 2007 water in channel was more turbid, less clear, than upstream Reach 4.

Bank structure: earthen banks of low flow channel comprised of past deposited sediment (wedge that crossed entire channel), the higher banks rising to the access road slope gently on north side (approx 3:1) and steeper on south side (approx 1:1).

Channel processes: low flow channel contains small flows, larger events flow onto adjacent benches and deposit sandy sediment, uncertain if excavated low flow channel is self sustaining and able to transport sediment or will need additional maintenance.

Copeland Creek – Reach 3

BIOLOGICAL CONDITIONS

Vegetation Composition: woody riparian vegetation (arroyo and weeping willows) is confined to the toe of the bank and forms a discontinuous band; isolated oaks, eucalyptus, and other upland woody species occur along the top of bank. Canopy closure less than 10% in most places, channel 80% filled with emergent vegetation.

Riparian Corridor: approx 20 ft wide vegetation corridor on each bank dominated by arroyo willow, mature oaks, and eucalyptus.

Instream Habitat: low flow channel provides run/glide habitat, with small riffles, and some deeper pools (3-4 ft deep).

Listed species with potential to occur: Known occurrence of steelhead; potential habitat for western pond turtle.



(c) Lower Reach 3 looking upstream (March 6, 2007).



(d) Lower Reach 3 crossing at Seed Farm Dr. (March 6, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Excavation of low flow channel into adjacent sediment benches occurred in 2003 along with extensive vegetation removal. SCWA is monitoring this reach to determine if the low flow channel design is sustainable. Currently (2007), no additional comprehensive maintenance measures are identified. In future, skimming of high benches on other side of the channel may be necessary if those benches aggrade significantly, or low flow channel itself may need occasional dredging of collected sediment. Monitoring and adaptive management will occur on this reach to better identify where and how much deposition continues. This reach does not have significant canopy closure over the channel and would benefit from additional plantings of woody canopy species, if capacity allows.

Copeland Creek – Reach 2

JURISDICTION: City of Rohnert Park owner,
SCWA maintenance easement

LOCATION: Seed Farm Drive to Hwy 101

ADJACENT LAND USE: Residential (single family
and multi occupancy) to north and
south

UPSTREAM: Copeland 3

LENGTH: 3,772 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 127 ft

AVERAGE TOP-OF-BANK WIDTH: 91 ft



(b) Mid Reach 2 looking downstream (March 6, 2007).

MAINTENANCE HISTORY



(a) Reach 2 looking downstream from Seed Farm Dr.
(March 6, 2007).

PHYSICAL CONDITIONS

Reach setting: long reach, upper reach has large in-channel bars, aggrading, that alternate along banks (photo b); lower reach has less sinuous deeper channel incised along higher bars (photo c, d).

Active channel: upper/mid reach has sinuous shallow low flow channel (6-8 ft wide), lower reach is a more linear channel, both deeper (2-4 ft) and wider (up to 15 ft) (photo c, d).

Bed sediments/texture: upper/mid reach channel bed/bars are medium sand dominated, downstream channel bed/bars are finer. In March 2007 water in channel was similar in turbidity to Reach 3 and less clear than Reaches 4/5.

Bank structure: upper/mid reach earthen banks of 4-6 ft height (1:1) adjacent to the in-channel sediment wedge and low flow channel (photo b), in lower reach banks are often steeper than 1:1 and 4-6+ ft high (photos c/d).

Channel processes: large low benches and alternating bars of mid reach store aggraded sediment, with occasional pools in main channel, lower reach becomes finer texture depositional environment, increased trash/debris in this reach and moving downstream.

Copeland Creek – Reach 2

BIOLOGICAL CONDITIONS

Vegetation composition: canopy closure is 25-50%, increasing downstream as the channel narrows and deepens. At breaks in the canopy, cattails grow in isolated patches on bars.

Riparian corridor: A solid band of willows (native Arroyo willows and non-native weeping willows) are found along the toe of the slope throughout the reach. A fringe of emergent wetland vegetation is present adjacent to willows, with rice cutgrass, watercress, and patches of cattails. A mixture of native and non-native trees is present at the top of bank and along the access road, including coast live oak and Monterey pine. The upper banks support shrubby vegetation dominated by non-natives such as Himalaya blackberry and cotoneaster, interspersed with ruderal herbaceous vegetation dominated by Harding grass.

Instream Habitat: channel sinuosity occurs between bars. The channel in the mid-reach is complex with riffles, runs, and isolated pools. Willows provides for additional habitat complexity through rootwads and overhanging roots, which have created a few larger pools with some woody debris.

Listed species with potential to occur: Steelhead are known to occur (reach is a migration corridor); potential habitat for western pond turtle.



(c) Lower Reach 2 looking downstream (March 6, 2007).



(d) Lower Reach 2 looking upstream (March 6, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations include selective bar grading/skimming where necessary, but should include alternating bar forms that provide sinuosity as currently observed (photo b). Other considerations include potential removal of cattails, and planting of more riparian vegetation (if capacity allows) to provide additional shade to retard cattail growth where the canopy is not entirely closed. Though not currently observed, removal of potential vegetation, debris blockages in the lower reach, toward Hwy 101, could be necessary in the future.

Copeland Creek South Fork – Reaches 2 & 1

JURISDICTION: City of Rohnert Park owner,
SCWA maintenance easement

LOCATION: Country Club Dr. to Seed Farm
Dr.

ADJACENT LAND USE: Residential to east,
railroad to west

UPSTREAM: Copeland 3

LENGTH: Reach 2: 738 ft
Reach 1: 2,756 ft

CHANNEL EASEMENT CORRIDOR WIDTH:

Reach 2: 68ft
Reach 1: 86 ft

AVERAGE TOP-OF-BANK WIDTH:

Reach 2: 126 ft
Reach 1: 42 ft



(b) Copeland Creek South Fork (Reach 2) looking upstream (March 6, 2007).

MAINTENANCE HISTORY



(a) Copeland Creek South Fork (Reach 2) looking upstream from Copeland Creek confluence (March 6, 2007).

PHYSICAL CONDITIONS

Reach setting: linear reach adjacent to narrow bench/floodplain that follows railroad alignment, channel was likely formed as the borrow ditch excavated to create railway berm (photo a).

Active channel: single channel 10-12 ft wide at north end, narrows to 6-8 ft at south end (photos a, b), flows observed 1-2 ft deep with occasional deeper pools, channel incised ~3 ft below bench/narrow floodplain on west side.

Bed sediments/texture: appear to be fines and a muddy bottom, with occasional riprap, in March 2007 water in channel was highly turbid, with oil sheen, and other visible poor water quality conditions.

Bank structure: earthen banks of low flow channel comprised of sediment on flat railway bench on west side, steeper bank on east side (~1:1).

Channel processes: low gradient channel has several blockages, both from sediment and vegetation plugs (photo c), in downstream Reach 2 the linear channel form is open water without riffles, bars, or any noticeable channel features.

Copeland Creek South Fork – Reaches 2 & 1

BIOLOGICAL CONDITIONS

Vegetation composition: 2006-2007 vegetation mapping indicates primarily ruderal vegetation along the banks with some areas of riparian scrub. Large areas of both reaches are filled with emergent vegetation within the ordinary high water mark.

Riparian corridor and canopy: riparian scrub dominates the east bank of Reach 2, no canopy closure over the creek. The rest of Reaches 1 and 2 are dominated by ruderal vegetation along the banks.

Instream habitat: some aquatic and bird habitat provided by cattail/marsh area in lower Reach 1, further upstream channel is choked with cattails, and downstream open channel is straight with few channel features.

Listed species with potential to occur: Potential habitat for western pond turtle.



(c) Copeland Creek South Fork (Reach 1) looking upstream (March 6, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Currently, Copeland Creek South Fork (Reach 1) is heavily clogged with cattails (photo c). It is uncertain if additional flow capacity is necessary in this reach and if dredging/removal will be required. Sediment management approaches should explore how to encourage additional trapping and filtering of fine sediments in this reach, which would provide downstream water quality benefits to South Fork Reach 2 and to Copeland Creek Reaches 3 and 2. South Fork (Reach 2) is a more open channel than Reach 1, but suffers from high turbidity and poor visual water quality with oil sheens, etc. Additional measures here that could improve water quality, filter pollutants, and trap fine sediments should be considered. Some type of managed cattail marsh approach may be appropriate as seen in the semi-open channel with cattails in upper Reach 2. Neither South Fork Reach 1 nor 2 have significant canopy closure over the channel and would benefit from additional plantings of woody canopy species, if flow requirements and any special railway requirements allow.

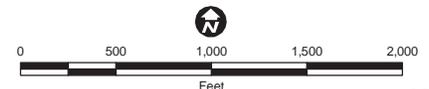


Vegetation Type

- Blackberry Scrub
- Mixed Riparian Scrub
- Riparian Woodland (full canopy)
- Riparian Woodland (up to 75% canopy)
- Riparian Woodland (up to 25% canopy)
- Riparian Forest
- Ruderal
- Willow Scrub
- Developed
- SMP Maintenance Reaches

Sources:
 Sonoma County Water Agency
 County of Sonoma
 AirPhotoUSA, 2005

FIGURE 4-41
Reaches and Vegetation
Upper Laguna (11 of 11)



1 inch equals 1,000 feet

Upper Laguna – Reach 7

JURISDICTION: Owned by City of Cotati, SCWA maintenance easement

LOCATION: Myrtle Ave. access to Benson Lane

ADJACENT LAND USE: Single family residential

UPSTREAM: Piped stormdrain tributary of Upper Laguna

LENGTH: 2,703 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 89 ft

AVERAGE TOP-OF-BANK WIDTH: 52 ft



(b) Upper Reach 7 looking downstream; recent maintenance work includes bank stabilization project on far bank and vegetation removal and tree planting on near bank (May 29, 2007).

MAINTENANCE HISTORY



(a) Upper Reach 7 looking downstream near pipe outfall; cattails creating stagnant pond with algae; vegetation recently removed and trees planted on bank in near ground (May 29, 2007).

PHYSICAL CONDITIONS

Reach setting: upper extent of Laguna channel system, upstream of Reach 7 is culverted; gentle gradient reach with stagnant ponding where flows blocked by instream cattails.

Active channel: channel bed is 8-12 ft wide; late spring flows are 6-12 inches deep with evidence of recent winter flows being 2-3 ft deep.

Bed sediments/texture: generally finer textured sediments with relatively high organic content (photo d).

Bank structure: linear trapezoidal channel with earthen banks sloped from 1:1 to 1.5:1 in upper reach and up to 3:1 in mid and lower reach; recent bank stabilization shown in photo b; recent tree planting along banks throughout reach.

Water quality (qualitative): where ponding creates stagnant pooling, algae has developed (photo a); shallow diffuse flows are turbid and muddy (photo d).

Channel processes: linear channel alignment with flows contained within engineered banks; gentle channel gradient results in net bed accumulation of sediments (up to 12-18 inches deep) without much bed forming of bars or other features (photo d); mid reach has low bench along bank adjacent to channel (photo e).

Upper Laguna – Reach 7

BIOLOGICAL CONDITIONS

Vegetation composition: Most of reach consists of ruderal grassland bank vegetation, some areas of riparian woodland with no canopy closure in upper part of reach. Recent plantings of a wide array of riparian and upland species should improve species diversity and abundance of native species. Plantings include box elder, white alder, bigleaf maple, Oregon ash, cottonwood, California walnut, blue elderberry, and various oaks.

Riparian corridor and canopy closure: Open canopy, no closure across creek, much of channel is filled with emergent vegetation. Recent canopy enhancement program should result in improved canopy over the next 5-10 years.

Instream habitat: Long straight reach contained in a trapezoidal channel with gentle banks. In its current configuration the instream habitat is limited to diffuse, shallow flow through emergent vegetation. In August 2007, the channel was dry in most, if not all, locations.

Listed species with potential to occur: known migratory habitat for steelhead, potential habitat for western pond turtle and listed plants.



(c) Looking downstream just above Lady Bug Park: note general bed sedimentation, fine muddy sediments, with shallow diffuse flow; recent tree plantings along bank throughout reach (May 29, 2007).



(d) Mid Reach 7 looking downstream at La Salle Ave. footbridge: trapezoidal mid reach channel has gentler sloping banks (3:1) than upstream with lower bench at base of bank; note recent tree plantings along upper and lower bank throughout reach (May 29, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Upper Laguna Reach 7 has recently been maintained for vegetation removal, as well as in channel sediment removal in the upper reach (photos a, b, c), and bank stabilization activities (photo b). Recent maintenance activities have also included extensive tree plantings along the stream banks, in upper, middle, and lower bank locations (see photos above). As such, the current focus of maintenance activity is to monitor the plantings and bed sedimentation. No urgent maintenance activities are recognized, though removal of channel cattails where they are causing severe flow constraints, ponding, and fostering algal growth should be considered pending ongoing monitoring.

Upper Laguna – Reach 6

JURISDICTION: Upper reach owned by City of Cotati with a SCWA maintenance easement; Lower Reach owned and maintained by SCWA

LOCATION: Benson Lane to East Cotati Ave.

ADJACENT LAND USE: Cotati single family home residential neighborhoods

UPSTREAM: Upper Laguna Reach 7

LENGTH: 1,327 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 63 ft

AVERAGE TOP-OF-BANK WIDTH: 50 ft



(b) Mid Reach 6 looking upstream near McGinnis Circle; wide and shallow channel with gentle gradient and banks (3:1), note recent tree planting along banks; reach is similar to Lower Reach 7 (May 29, 2007).

MAINTENANCE HISTORY



(a) Upper Reach 6 looking downstream from Benson Lane; reach has gentle gradient and banks (3:1); is depositional along most of its bed; and has recent tree planting along banks; reach is similar to Lower Reach 7 (May 29, 2007).

PHYSICAL CONDITIONS

Reach setting: upper Laguna channel system, linear trapezoidal channel with gentle gradient and gently sloping banks.

Active channel: channel bed is 8-16 ft wide; late spring flows are shallow 6" deep (photos a/b) with evidence of recent winter flows being approx 2 ft deep; in lower reach channel bed is covered with thick vegetation with smaller micro channels carrying shallow flows diffusely.

Bed sediments/texture: generally finer textured sediments with relatively high organic content; some sands in upper reach derived from adjacent bank materials.

Bank structure: linear trapezoidal channel with earthen banks gently sloped from 2:1 to 3:1; recent tree planting along banks in upper reach (photos a/b).

Water quality (qualitative): shallow diffuse flows are turbid, muddy, and high in organic content.

Channel processes: linear channel alignment with flows contained within engineered banks; gentle channel gradient results in net bed accumulation of sediments.

Upper Laguna – Reach 6

BIOLOGICAL CONDITIONS

Vegetation composition: Bank vegetation ruderal grassland with occasional trees and shrubs occurring along banks.

Riparian corridor and canopy closure: No canopy closure, much of Laguna Reach 6 is overgrown with emergent vegetation within channel. Recent riparian plantings will likely increase canopy cover in the foreseeable future.

Instream habitat: Surface flow was observed in May of 2007, but there was no visible surface flow in Reach 6 in August 2007. The channel is generally trapezoidal and straight with little to no complexity and diffuse low flow through emergent vegetation that covers the channel bottom.

Listed species with potential to occur: Known occurrence of steelhead (reach is a migration corridor); potential habitat for western pond turtle and listed plant species; California tiger salamander are unlikely to occur in the potential upland habitat.



(c) Lower Reach 6 looking downstream near McGinnis Circle; culvert tributary enters from left; in-channel vegetation increasing compared to upstream section seen in photo b (May 29, 2007).



(d) Lower Reach 6 looking upstream from East Cotati Avenue; abundant shrub and grass vegetation both in the channel and along the banks throughout lower reach (May 29, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

The upper portion of the Upper Laguna Channel Reach 6 has recently undergone sediment removal, vegetation thinning, and tree planting along the banks (photo b). The upper reach does not appear to require any pressing maintenance but should be monitored for tree survival and success. Downstream past McGinnis Circle, in channel vegetation in Reach 6 significantly increases and should be considered for thinning and removal activities, especially toward East Cotati Ave. (photos c/d).

Upper Laguna – Reach 5

JURISDICTION: Owned and maintained by SCWA, located in the City of Cotati

LOCATION: East Cotati Ave. to Gravenstein Way

ADJACENT LAND USE: Single family residential

UPSTREAM: Upper Laguna Reach 6

LENGTH: 2,239 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 58 ft

AVERAGE TOP-OF-BANK WIDTH: 46 ft



Feb 17, 2007



May 29, 2007

(a) Upper Reach 5 looking downstream from East Cotati Ave. crossing; note some mild lower bank erosion (seen in Feb photo) where flows emerge from road crossing and hit bank; significant in-channel vegetation grown during spring season.

MAINTENANCE HISTORY



(b) Mid-Reach 5 looking upstream; far bank (left) recently cleared of vegetation; near ground (center) also recently cleared and trees planted; thick blackberry vegetation remains on right bank (center back) (May 29, 2007).

PHYSICAL CONDITIONS

Reach setting: upper Laguna channel system, trapezoidal channel with increased sinuosity compared to upstream linear reaches.

Active channel: channel bed is 8-14 ft wide; late spring flows are shallow in upper reach, approximately 1 ft deep and deepen in lower reach up to 3 ft deep in a well defined low-flow channel (photo d).

Bed sediments/texture: generally finer textured sediments of silts and mud, but less organic material and more sand content than Reaches 6 and 7 upstream.

Bank structure: linear trapezoidal channel with earthen banks sloped from 2:1 to 1:1 (steeper banks than upstream reaches); recent vegetation clearing and tree planting along banks in mid and lower reach (photos b and c)

Water quality (qualitative): clearer flows than upstream reaches, mid and lower reach has deep well defined low flow channel.

Channel processes: trapezoidal channel provides some sinuosity through reach (possibly following historic channel alignment); well defined low flow channel provides deeper low flow conditions than reaches upstream.

Upper Laguna – Reach 5

BIOLOGICAL CONDITIONS

Vegetation composition: Some stretches with riparian woodland, most of reach dominated by ruderal grassland or blackberry thicket on the banks.

Riparian corridor and canopy closure: Canopy closure generally 0% to a maximum of 25%. A small stand of willows is growing along the western bank in the lower reach and provides some shade and limited complexity. Emergent wetland vegetation growing in some of the reach, particularly the upper region.

Instream habitat: In August 2007 this was the only reach of Laguna upstream of Highway 101 containing significant surface flow. The reach has steep banks and a generally flat bottom creating a homogeneous channel lacking complexity. Sections of still water dominate the lower reach, while the upper reach is dominated by expansive growth of emergent vegetation clogging the channel.

Listed species with potential to occur: known migratory habitat for steelhead, potential habitat for western pond turtle and listed plants.



(c) Mid Reach 5 looking downstream; bank vegetation recently cleared and trees planted on near bank; vegetation at base of bank at channel's edge left in place (May 29, 2007).



(e) Lower Reach 5 looking downstream at Gravenstein Way crossing; sediment is collecting in low bars just upstream of crossing (May 29, 2007).



(d) Lower Reach 5 looking upstream; upper bank (left) recently cleared of vegetation, grasses remain along lower bank; bank (right) not cleared recently; lower bank is steep with 2-3 ft drop into well defined low flow channel (May 29, 2007).

Upper Laguna – Reach 5

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

In Upper Laguna Reach 5, vegetation removal activities and bank tree planting have recently occurred throughout the mid and lower reach as shown in photos b through e above. Other maintenance considerations and opportunities for Reach 5 include monitoring the bank erosion and sloughing observed just downstream of the East Cotati Ave. crossing where flows are somewhat directed into the lower bank. The upper section of Reach 5 appears to experience significant in-channel seasonal vegetation growth (photo a) which should also be monitored for potential thinning. Note the mid and lower sections of the reach that have a more defined low flow channel do not experience as rapid seasonal vegetation growth in the channel bed (photo d). The section just upstream of the Gravenstein Way crossing should also be monitored for on-going sediment accumulation and bar formation. Apparently sediments are falling out just upstream of the crossing where the gradient appears to lessen. This problem appears to be related to the extensive wedge of sediment accumulating downstream of the crossing (see Reach 4 for discussion).

Upper Laguna – Reach 4

JURISDICTION: Owned and maintained by SCWA

LOCATION: Cotati: Gravenstein Way to Hwy 101

ADJACENT LAND USE: Upper reach single family residential, mid and lower reach mix of apartments to south and light commercial uses to north

UPSTREAM: Upper Laguna Reach 5

LENGTH: 1,996 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 110 ft

AVERAGE TOP-OF-BANK WIDTH: 66 ft



(b) Mid Reach looking downstream; some channel sinuosity within established banks; low bench adjacent to channel; abundant water plantain and other emergents growing and choking channel; high bank vegetation provides shading (May 29, 2007).

MAINTENANCE HISTORY



(a) Upper Reach looking downstream; thick in-channel vegetation of grasses, cattails, and willows create some stagnant pooling just upstream of photo (May 29, 2007).

PHYSICAL CONDITIONS

Reach setting: upper Laguna channel system, trapezoidal channel with moderate sinuosity relative to other linear reaches, lower reach becomes concrete channel (photo e).

Active channel: channel bed is 12-16 ft wide; late spring flows are shallow throughout reach 6-12" deep.

Bed sediments/texture: generally finer textured sediments of silts and mud, with high organic content in plantain sections (photo b); coarse sediments of sand and small gravel observed in concrete channel section (photo e).

Bank/bed structure: trapezoidal channel with earthen banks sloped from 2:1 to 1:1; upper reach has wide bench adjacent to low flow channel (photo a); mid reach also has low benches adjacent to channel (photos b, c, d); lower section entirely concrete.

Water quality (qualitative): clearer flows than upstream reaches, some turbidity in water plantain-dominated sections, some algae and debris in lower concrete section.

Channel processes: within trapezoidal channel, some very slight pool/run sequences that follow sinuous low flow channel (photo b); where water plantain or cattails are very thick low flows are blocked; concrete section provides a "flume" type environment where velocities are higher and flows pass quickly toward the Highway 101 crossing (photo e).

Upper Laguna – Reach 4

BIOLOGICAL CONDITIONS

Vegetation composition: Interspersed areas of riparian woodland with high canopy coverage and ruderal grassland. Riparian woodland is dominated by non-native trees such as weeping willow and large Eucalyptus with scattered redwoods. In many sections banks are completely covered by blackberry.

Riparian corridor and canopy closure: Riparian woodland canopy closure in some areas is 25% or so, in other areas the dominant vegetation is ruderal grassland and there is no canopy across the creek at all. Emergent vegetation grows in much of the creek bed throughout this reach.

Instream habitat: The channel was wetted in May 2007, but dry in most places by August 2007. Small isolated pools remain, but water quality appears low with substantial stagnation. Aquatic habitat in the lower concrete section is high degraded. This section was completely dry in August 2007. Throughout much of the reach emergent vegetation stretches across the channel causing diffuse flows when surface water is present.

Listed species with potential to occur: known migratory habitat for steelhead, potential habitat for western pond turtle and listed plants.



(c) Mid Reach looking upstream; mid reach sections alternate between shaded areas dominated by water plantain and non-shaded sections with cattails and other in-channel vegetation (May 29, 2007).



(e) Lower Reach near Hwy 101; concrete channel with vertical walls (May 29, 2007).



(d) Lower Reach near transition to concrete channel; abundant willow vegetation in channel and along banks provides shading (May 29, 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

In Upper Laguna Reach 4, management considerations focus on opportunities to thin or remove vegetation where abundant in-channel vegetation is blocking or constraining flows. Vegetation conditions along Reach 4 will be monitored during the annual channel reconnaissance with priority vegetation clearing areas identified (such as seen in photo b). A large sediment and vegetation wedge at the upper end of Reach 4 just downstream of the Gravenstein Way bridge appears to be creating a significant backwatering into Reach 5. This area should be cleared to allow flow to move through lower Reach 5 and under the bridge unimpeded.

Cotati Creek – Reaches 2 & 1

JURISDICTION: Owned and maintained by SCWA

LOCATION: Reach 2 runs from upstream of Delano Park to Page St. Reach 1 runs from Old Redwood Hwy. to the Upper Laguna 6 channel confluence. Note, these reaches aren't contiguous and there is a short gap in jurisdiction between Page St. to Old Redwood Hwy.

ADJACENT LAND USE: Cotati single family home residential neighborhoods, Cotati commercial center, and Delano Park.

UPSTREAM: Upper Cotati Creek

LENGTH: Cotati 2: 878 ft
Cotati 1: 833 ft

CHANNEL EASEMENT CORRIDOR WIDTH:

Cotati 2: 58 ft
Cotati 1: 28 ft

AVERAGE TOP-OF-BANK WIDTH:

Cotati 2: 21 ft
Cotati 1: 24 ft



(b) Cotati Creek Reach 1 looking downstream from Old Redwood Hwy, concrete lined channel with paver block banks is filling uniformly with sediment across its bed (Dec. 16, 2008).

MAINTENANCE HISTORY



(a) Cotati Creek Reach 2 looking upstream from Delano Park crossing; abundant vegetation including blackberry shrubs and willows fill the channel; some larger trees > 3-4" diameter are growing in mid channel bed. (Dec. 16, 2008).

PHYSICAL CONDITIONS

Reach setting: Cotati Creek is a tributary to the Upper Laguna system, joining at Upper Laguna Reach 6; Both Reach 2 and Reach 1 are severely constrained with little corridor width (Reach 2) or no stream corridor width (Reach 1).

Active channel: channel bed is 8-16 ft. wide in Reach 2 and 16-20 ft. wide in Reach 1; channel bed is earthen in Reach 2; and hardened with concrete or paver blocks in Reach 1; Reach 1 experiences active deposition with a long and continuous depositional bar (photos b, c, c).

Bed sediments/texture: sands and finer sediment materials observed in depositional bars.

Bank structure: Reach 2 is a trapezoidal channel with ripraped banks steeply sloped 1:1; Reach 1 is a rectangular boxed channel with vertical banks, entirely hardened and made from masonry blocks.

Water quality (qualitative): shallow diffuse flows are turbid, muddy in places, no trash observed.

Channel processes: linear channel alignment with flows contained within engineered and vertical banks; high sediment load and gentle channel gradient results in net bed accumulation of sediments; sediments collect throughout Reach 1.

Cotati Creek – Reaches 2 & 1

BIOLOGICAL CONDITIONS

Vegetation composition: Bank vegetation in Reach 2 comprised mostly of shrubs and blackberry, willows, alders, and poplars growing in the channel and on bank. Reach 1 has emergent vegetation growth in deposited sediment despite the concrete channel lining.

Riparian corridor and canopy closure: Reach 2 canopy closure (25%) provided by trees along north bank, and some shrub/blackberry overhanging into channel from south bank (10%). Reach 1 has no bank vegetation or canopy cover.

Instream habitat: Reach 2 is a narrow channel choked with vegetation and limited habitat value; upstream the channel transitions to a roadside ditch and downstream the channel becomes entirely hardened. Reach 1 provides little instream habitat due to its constricted easement, entirely hardened structure, and uniformly deposited sediment.

Listed species with potential to occur: Both reaches are potential habitat for western pond turtle; California tiger salamander are unlikely to occur in the potential upland habitat.



(c) Cotati Creek Reach 1 looking downstream from Ross St.; channel formed in concrete and paver blocks; 1-2 ft depth of sedimentation uniformly across the channel bed width; cattails growing in sections. (Dec. 16, 2008)



(d) Cotati Creek Reach 1 looking upstream from residential development near Marsh Way; channel formed in concrete and paver blocks; 1-2 ft of sedimentation across entire channel bed width; ruderal and emergent vegetation growing in sections. (Dec. 16, 2008)

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

In Reach 2, management considerations are focused toward improved vegetation management. In channel trees can be limbed or thinned to provide better flow conveyance. Banks that are overwhelmed with blackberry shrubs can be thinned and cleared. In Reach 1, management considerations focus on sediment removal from the concrete and paver lined channel. As shown in the photos (b, c, d) the Cotati Creek channel is aggrading uniformly across its bed at depths up to 2 ft of sediment. Sediment removal activities can provide additional flow conveyance. There are not good opportunities for aquatic resource or wetland enhancement in Reach 1, and only limited opportunities in Reach 2, associated with the vegetation thinning.