

SCWA Easements

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

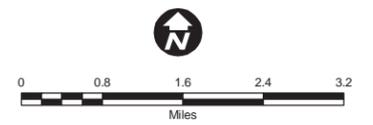
Elevation, ft.

- | | |
|--|--|
| █ 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 4-9

Santa Rosa Subbasin



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



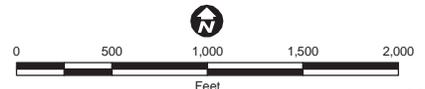


Vegetation Type

- | | | | | | |
|--|--------------------------------------|--|-----------------|--|-------------------------|
| | 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 4-10
Reaches and Vegetation
Santa Rosa (1 of 13)



1 inch equals 1,000 feet

Middle Fork of Brush Creek – Reaches 2 & 1

JURISDICTION: Owned in-fee and maintained by SCWA

LOCATION: Reach 2: Downstream of Brush Cr. Reservoir to Badger Rd.
Reach 1: ~1000 ft downstream of Badger Rd. to Montecito Blvd.

ADJACENT LAND USE: Single family residential and ranchette

UPSTREAM: Brush Creek Reservoir is directly upstream of Reach 2; there is an ~1000 ft gap in SCWA's maintenance responsibility before Reach 1

LENGTH: Reach 2: 1,310 ft.
Reach 1: 2,612 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Reach 2: 33 ft.
Reach 1: 56 ft.

AVERAGE TOP-OF-BANK WIDTH: Reach 2: 37 ft.
Reach 1: 58 ft.



(b) Bottom of Middle Brush Reach 2, looking downstream toward Badger Rd. crossing. Channel is still incised as evidenced by exposed and undercut roots on many riparian trees. Riparian canopy is dense in this area and through Reach 1. Channel substrate is dominated by gravels and appears to be augmented by eroding rip-rap (foreground) (March 2008).

MAINTENANCE HISTORY



(a) Middle Brush Reach 2, ~1000 ft downstream of reservoir looking downstream. Channel appears to be deeply incised with steep sloped banks. The channel also supports formation of gravel bar features (foreground left) and is actively recruiting woody debris (background left) (March 2008).

PHYSICAL CONDITIONS

Reach setting: Reach 2 and 1 are below the Brush Creek Reservoir and show signs of channel down-cutting or incision; channel is relatively steep emerging from headwater and hills areas upstream.

Active channel: 6-10 ft wide inset between nearly vertical banks from 8-16 ft high; flow depth from 3-12 in.

Bed sediments/texture: dominated by cobbles and gravels with slow fining toward Montecito Blvd; little evidence of fine sediment deposition.

Bank structure: slopes are generally earthen and very steep to near vertical (>1:1); signs of historic bank protection along the toe of the slope in many locations with large angular rip rap both in place as well as in the channel.

Channel processes: Reaches 2 and 1 both appear to be erosion and sediment transport reaches; the upstream dam has clearly reduced upstream sediment inputs and resulted in significant channel incision and chronic bank instability.

Water quality (qualitative): moderate to clear in March 2008.

Middle Fork of Brush Creek – Reaches 2 & 1

BIOLOGICAL CONDITIONS

Instream habitat: dominated by short runs and larger riffles (composed of gravels, cobbles, and occasional eroding rip-rap); water was generally shallow in March 2008 (>12"); small pools form occasionally around exposed root wads, undercut banks, and woody debris jams.

Vegetation composition: Vegetation includes a 15-25 ft width riparian woodland stringer along both sides of the creek for much of its length. Dominant trees are coast live oak, valley oak, bay laurel, and redwood. Understory is dominated by ivy in most areas observed. There was little to no emergent vegetation observed in the channel.

Riparian corridor and canopy closure: 15-25 ft. wide corridor on each bank with canopy trees growing at the toe of slope, the mid-bank, and top of bank; canopy closure between 50%-75% throughout the reaches.

Listed species with potential to occur: limited potential for listed salmonids in Reach 2 due to migration barrier (2-4 ft. drop) at downstream end of Badger Rd. crossing; since steelhead are known to rear in lower Brush Creek, they have the potential to occur in Reach 1; both reaches are potential habitat for western pond turtle.



(c) Reach 1 ~ 1000ft upstream of Montecito Blvd, looking upstream at eroded banks, similar to Reach 2, this reach is incised, resulting in undercut stream banks. This instability has led to overhung exposed roots and recruitment of woody debris (March 2008).



(d) Reach 1, looking downstream toward the Montecito Blvd. crossing from the confluence with Rincon Cr. This section of Middle Brush contains grouted rip-rap along the trapezoidal banks and portions of the channel bottom from the confluence with Rincon Cr (at photo point) downstream to the crossing (March 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for the Middle Fork of Brush Creek focus on bank stabilization and erosion control. The current density of large woody trees and complex roots systems appears to be slowing the level of erosion and downcutting occurring in both reaches. As downcutting continues and more trees fall, the near vertical banks along the Middle Fork of Brush Creek will continue to destabilize and potentially erode channel material into creek. Locally, increasing the complexity of pool habitat in Reach 1 could provide enhanced habitat for rearing steelhead and addressing the passage barrier/obstruction at Badger Rd. could allow steelhead to access additional spawning and rearing habitat in Reach 2. Control of ivy and replanting with native understory species could provide benefits to a wide array of riparian species.

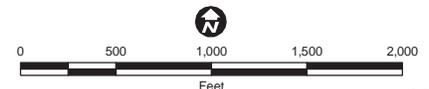


Vegetation Type

- 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 4-11
Reaches and Vegetation
 Santa Rosa (2 of 13)



1 inch equals 1,000 feet

Santa Rosa Creek – Reach 0

JURISDICTION: SCWA owned and maintained
LOCATION: Near Quigg Dr. and Acacia Lane
ADJACENT LAND USE: Residential, Hwy 12 nearby
UPSTREAM: Upper Santa Rosa Creek and Spring Lake
LENGTH: 698 ft
CHANNEL EASEMENT CORRIDOR WIDTH: 78 ft
AVERAGE TOP-OF-BANK WIDTH: ~50 ft



(b) Looking upstream from the middle of the reach. Small check dam across the channel made of rock and grouted, small dam features moderate flow, concentrating elevation drops and velocity changes at structures (December 16, 2008).

MAINTENANCE HISTORY



(a) Entrance to public trail on north side of creek (December 16, 2008).

PHYSICAL CONDITIONS

Reach setting: reach located in mid watershed, upstream of Santa Rosa Plain but downstream of the headwater areas, and downstream from the Santa Rosa Diversion structure to Spring Lake.

Active channel: channel 12 ft wide (photo b) widening to 15 ft downstream (photo c). Straight channel, no low flow channel, but low benches adjacent to main channel 2-3 ft. above channel.

Bed sediments/texture: large cobbles and gravels throughout. No fines present (perhaps removed at the diversion further upstream).

Bank structure: Wide easement with gentle 2:1 slopes at the bank and 3:1 slopes on the north bank where a public trail is maintained. Exposed alder roots along both banks, but banks are stable.

Water quality: clear water observed on 12/16/08 flowing approximately 5 cfs after 2 days of rain.

Channel processes: sequence of riffles and glides throughout reach, sequence of check dams moderates flows between glides/runs (photo b)

Santa Rosa Creek – Reach 0

BIOLOGICAL CONDITIONS

Vegetation composition: riparian woodland species grow densely along banks throughout the reach. Thickets of blackberry, ivy, and willow line both banks. Emergent species such as carex and other grasses overhang into the channel in patches.

Riparian corridor and canopy closure: 75-100% canopy cover provided by tall alders, with understory species beneath.

Instream habitat: Cool waters in combination with instream flow diversity with glides/runs and riffles (some caused by instream check dams) provides very good habitat for cold water species, such as Chinook and steelhead. Small check dams are not too large as to create fish passage barriers (photo b); riparian canopy is well developed and thick.

Listed species with potential to occur: California freshwater shrimp (historic), western pond turtle, steelhead, Chinook, special-status plants.



(c) Looking downstream from the middle of the reach. Note fully shaded channel and lack of emergent vegetation (December 16, 2008).



(d) Looking east from downstream end of the reach toward the upper Santa Rosa Creek headwaters (seen in distance). Creek is on the right. Note dense riparian vegetation lining creek corridor (December 16, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Though blackberry and willows are growing thick along the northern upland streambank, SCWA should consider not thinning this vegetation along the higher northern banks as it provides a screen from the public who use the adjacent trail (photo d). High bank vegetation does not appear to be constricting or limiting flow conveyance in channel, but it should be evaluated. If the vegetation is thinned, increased public access would occur and habitat quality in the channel may degrade as a result. The ivy lining both banks should, however, be thinned to encourage growth of native understory species. Banks appear to be stable and the check dam shown in photo b does not appear to impact channel processes. Consider planting different types of riparian trees to encourage biodiversity (all the tall trees in this reach are alders).

Brush Creek – Reach 2

JURISDICTION: Owned and maintained by SCWA

LOCATION: Between Montecito Blvd and Hwy 12

ADJACENT LAND USE: Residential

UPSTREAM: Middle Brush Creek Reach 1 is directly upstream

LENGTH: 6,937 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 104 ft

AVERAGE TOP-OF-BANK WIDTH: 59 ft



(a) Brush Cr Reach 2, looking downstream from the Montecito Blvd. crossing. Channel is straight and contains numerous in-channel bars. Also notice that heavy growth of trees and shrubs along the banks (March 2008).



(b) Brush Creek Reach 2, just downstream of Austin Cr. confluence. Channel bed is colonized by grasses and emergent vegetation; toe of the banks are lined with young willows full of debris from recent high flows (March 2008).

MAINTENANCE HISTORY

PHYSICAL CONDITIONS

Reach setting: Reach 2 is a transition between the narrow higher gradient reaches of Middle Brush Creek tributary and the lower gradient of the mainstem Santa Rosa Cr. This reach has been straightened and shows signs of deposition (photos a/b) as well as erosion and transport.

Active channel: 10-18 ft wide inset between steep rocky banks from 10-14 ft high; water depth between 2"-2'.

Bed sediments/texture: gravels near Montecito Blvd. with significant fining toward Hwy 12; sediment bars begin to appear at the top of the reach (photo a) and increase in size, distribution, and density moving downstream.

Bank structure: slopes are generally 2:1 rip-rapped with soil and dense vegetation developed in-situ, hiding the rock in most places.

Channel processes: Slope in Middle Brush 1 upstream appears to effectively convey sediment, now downstream of Montecito Blvd. Brush 2 becomes increasingly depositional with in-channel bars, margin bars, and sediment aggradation across the channel bottom increases toward Hwy 12.

Water quality (qualitative): moderate to clear in March 2008.

Brush Creek – Reach 2

BIOLOGICAL CONDITIONS

Instream habitat: Extensive in-channel bars have created small pools and clean riffles in many locations (photo a). In areas without bar development or where sediment has aggraded across the channel, flow is diffuse through vegetation (photos b and d). In downstream reaches where margin bar development and willow development at the toe of slope have lead to a confined low-flow channel long runs exist with depths between 1-2 ft. (photo c). Straightened channel alignment does limit more natural stream form.

Vegetation composition: Vegetation includes a narrow width riparian corridor stretching from the toe of bank to above the top of bank which consists of a mix of redwood, weeping willow, cotoneaster, bottlebrush, and buckeye. Arroyo willow is dominant along the toe of slope. Understory is dominated by blackberry and fennel in areas with limited or no canopy. Emergent vegetation dominates the channel bottom in many locations with thick patches of cattail (photo d) or grasses (photo b) covering the channel bottom.

Riparian corridor and canopy closure: 20-30 ft. wide corridor on each bank with canopy trees growing from the toe of slope, the mid-bank, and top of bank; canopy closure is low, between 0%-25% throughout the reach.

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



(c) Middle section of Brush Cr. Reach 2, looking upstream. Though cut in last few years, the dense line of willows at the toe of bank have re-established, creating a flow impediment and deflecting water onto the opposite bank. Willows on one side of the channel and a sediment bar on the other create a single, open, low flow channel (March 2008).



(d) A lower section of Reach 2, looking upstream; entire flat channel bed is covered in cattails with low flows forced through multiple shallow pathways. The abundant cattails have all been pushed down by recent flows (March 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Brush Creek Reach 2 focus on targeted sediment removal to increase channel capacity. Field observations indicate that flows in March 2008 reached to within 3 feet of top of bank. Response to these moderate storms suggests that conveyance may be impacted by sediment. Based on the extent of instream emergent vegetation growth and willow growth along the toe of slope, vegetation maintenance will need to be conducted in the near term. Finally, due to the restoration efforts downstream on Reach 1, maintenance that allows for creating a low flow channel, increasing habitat complexity both instream and along the riparian corridor, and generally improving habitat conditions would provide benefits to steelhead as well as a host of riparian and aquatic species.

Austin Creek – Reach 3

JURISDICTION: Owned and maintained by SCWA

LOCATION: Between Boas Dr. and Middle Rincon Rd.

ADJACENT LAND USE: Residential

UPSTREAM: Non SCWA maintained Austin Cr that continues upstream into Mayacamas hills

LENGTH: 2,958 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 63 ft

AVERAGE TOP-OF-BANK WIDTH: 37 ft



(b) Looking downstream about 600 ft. from Boas Dr. Undercut bank and pool formed under the exposed roots to right. Steep bank slopes on the left, generally dense canopy cover in this portion of Reach 3 (March 2008).

MAINTENANCE HISTORY



(a) Looking downstream from Boas Dr., channel is narrow and confined by rip-rapped banks on both sides. Sloughed rip has eroded in many places and is now part of the stream bed, creating small cobble riffles (March 2008).

PHYSICAL CONDITIONS

Reach setting: Reach 3 is a transition between the narrow, higher gradient and naturalistic reaches of upper Austin Creek and the wider, trapezoidal reaches of lower Austin Cr (2 and 1). The upper portion of this reach maintains some natural channel elements (photos b/ c) while the lower portions of this reach are straightened trapezoidal channels and lack complexity (photo d).

Active channel: 4-6 ft wide upstream and 8-10 ft wide downstream; inset between steep rocky banks from 10-14 ft high; water depth ranges from 4"-2'.

Bed sediments/texture: dominated by coarse gravels near Boas Dr and transitioning into a mix of gravel, sand, and silt by Middle Rincon Rd; small point bars exist in the upper portions of the reach, but have been replaced by cross channel wedges near the bottom.

Bank structure: slopes are generally between 2:1 and 1:1 with either rip-rap and soil (photo a) or grouted rip-rap (photo d).

Channel processes: The slope and channel geometry upstream of Jack London Dr appears to effectively convey fine sediment, while creating small gravel point bars; downstream of Jack London the channel is straightened, maintains a trapezoidal geometry and appear to be aggrading with a mix of fine and coarse sediments.

Austin Creek – Reach 3

Water quality (qualitative): moderately clear in March 2008.

BIOLOGICAL CONDITIONS

Instream Habitat: Upstream, gentle meanders and some incision has led to the formation of gravel bars and undercut banks. These features, in turn, have led to the creation of riffle-run sequences and small pools. These portions of the reach are also shaded by a dense canopy on steep slopes. Downstream, habitat value diminishes (photo d) and flow is shallow and diffuse through dense emergent vegetation across the wide channel bottom.

Vegetation composition: Upstream the reach supports a narrow riparian corridor stretching from the toe of slope to above the top of bank which consists of a mix of old eucalyptus, oaks, maples, acacia, and alders (photo b/c). Alders dominate the toe of slope. Understory is dominated by a mix of shrubs and ivy. Downstream of Jack London Dr, vegetation is dominated by ivy, fennel, cattails, and grasses with little to no large wood species (photo d).

Riparian corridor and canopy closure: 10-15 ft. wide corridor on each bank with canopy trees growing from the toe of slope, the mid-bank, and top of bank; canopy closure is high in the upper portion (~75%) and low (between 0%-25%) in the lower portions of the reach.

Listed species with potential to occur: known occurrence of western pond turtle, known occurrence of steelhead, reach is a migration corridor with rearing habitat.



(c) Looking downstream ~900 ft. downstream of Boas Dr. Here the channel makes a gentle meander around a d-shaped depositional bar. The bar is dominated by gravels and supports some instream complexity with the associated riffles and pools surrounding the bar. The canopy is still dense in this portion of the reach.



(d) Looking downstream from Jack London Dr. Notice the extreme change in the character of the stream that occurs just upstream of this crossing (compare to photo c). The canopy has receded, the channel is straightened, and emergent vegetation (cattails) now covers the trapezoidal channel bottom.

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Austin Creek Reach 3 include focused sediment and cattail removal downstream of Jack London Dr. and a variety of habitat enhancement opportunities. Although SCWA has no ownership and maintenance responsibility upstream of Boas Dr, the channel (although confined) appears to continue for at least 1.4 miles and supports additional gravel bars and a dense riparian canopy. As such, there might be value in performing maintenance in the lower portion of Reach 3 that extends the length of higher quality habitat from the headwaters down to Middle Rincon Dr. This could include installation of a low flow channel downstream of Jack London Dr. and a planting plan to increase riparian canopy.

Austin Creek – Reaches 2 & 1

JURISDICTION: Owned in-fee and maintained by SCWA

LOCATION: Reach 2: Middle Rincon Rd. to Ducker Cr. Confluence
Reach 1: Ducker Confluence to Brush Cr. Confluence

ADJACENT LAND USE: Residential

UPSTREAM: Austin 3

LENGTH: Austin 2: 2,282 ft.
Austin 1: 1,331 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:

Austin 2: 129 ft.
Austin 1: 101 ft.

AVERAGE TOP-OF-BANK WIDTH: Austin 2: 61ft.
Austin 1: 67 ft.



(b) Reach 2, looking upstream from grade control structure and large pool feature (near Benicia Dr.). Austin 2 and 1 both contain a number of in-stream grade control structures. There are 2 of these structures in Reach 2 and Reach 1 appears to have a number of rock weir structures upstream from the confluence with Brush Cr. (photo d) (March 2008).

MAINTENANCE HISTORY



(a) Reach 2 looking downstream from Middle Rincon Rd. Vegetated sediment bars form in the middle of the channel and stretch across the channel in the background. Channel x-section is trapezoidal and linear (March 2008).

PHYSICAL CONDITIONS

Reach setting: Reach 2 and 1 are both straightened and contain grade control structures to stabilize the profile of the engineered channel; gradient is slowly lessening through these two reaches, but the channel is still steeper than the Santa Rosa Plain downstream.

Active channel: 6-10 ft wide through both reaches, channel depth 6-12 ft below banks, with flow depths ranging from 2-6" along most of the channel with depths of 2-6 ft. at the two large pools below drop structures (photo b).

Bed sediments/texture: mix of gravel, sand, and silt at the top of Reach 2 and then fining to sand and silt in Reach 1.

Bank structure: slopes are generally between 1:1 and 2:1 with either rip-rap and earth or grouted rip-rap (photo b).

Channel processes: gradient appears to be the key control of this reach with 2 concrete grade control structures in Reach 2 and possibly a number of submerged rock weirs in Reach 1; channel maintains its trapezoidal geometry and appears to be aggrading with an increasing trend of in-channel bars formed by a mix of fine sediments. Major sediment wedges are located at confluences with smaller tributaries. Note that the upper section of Reach 2 contains a deep secondary channel that appears to

Austin Creek – Reaches 2 & 1

intercept run-off from storm drains on the south side of the channel (photo c)

Water quality (qualitative): moderately clear in March 2008.

BIOLOGICAL CONDITIONS

Instream habitat: Habitat in this reach is limited by the dominance of shallow, uniform runs interspersed by short sections of diffuse flow through in-channel bars and emergent vegetation; in some areas the in-channel bars do create some habitat complexity, although these areas are limited in size and distribution; large deep pools exist downstream of grade control structures, but the pools are devoid of cover, vegetation or complexity.

Vegetation composition: The reaches support a narrow and sparse riparian corridor stretching from the toe of slope to above the top of bank which consists of a mix of shrubs and trees including weeping willows, maples, acacia, arroyo willow and alders (photo b and c). Willow and alders are at the toe of slope when they exist. Understory is dominated by ivy, fennel, cattails, and grasses with little to no large wood species (photo b and d).

Riparian corridor and canopy closure: 10-15 ft. wide corridor on each bank with very limited canopy closure ranging from 0% (dominant case) to 25% (rare).

Listed species with potential to occur: potential habitat for western pond turtle, known occurrence of steelhead, reach is a migratory corridor.



(c) Secondary channel: The top photo shows Austin Cr to the left and the secondary channel to the right, the bottom photo is looking upstream from within the secondary channel (March 2008).



(d) Reach 1 looking downstream toward Brush Cr confluence. Note grouted rip-rap on the right bank, small bars along the channel margin, and the dense cattail bar at the confluence (far center) (March 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Austin Creek Reach 2 and 1 range from focused sediment and cattail removal at confluences and upstream of grade control structure to a variety of habitat enhancement opportunities. Enhancements to fish habitat could include installation of a low flow channel and canopy enhancement to increase shade and complexity.

Ducker Creek – Reaches 2 & 1

JURISDICTION: Owned and maintained by SCWA

LOCATION: Ducker 2: Middle Rincon Rd to Rinconada Dr.
Ducker 1: Rinconada Dr. to Confluence with Austin Cr

ADJACENT LAND USE: Suburban residential development on both sides of Reach 2 and 1.

UPSTREAM: Non-SCWA maintained reach

LENGTH: Ducker 2: 841 ft.
Ducker 1: 1,965 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Ducker 2: 71 ft.
Ducker 1: 70 ft.

AVERAGE TOP-OF-BANK WIDTH: Ducker 2: 42 ft.
Ducker 1: 45 ft.



(b) Reach 2, looking downstream from middle of the reach. Notice the channel is still relatively uniform and similar to photo a. Notice the lateral bar along the channel margin on the right. Also notice the line of water plantain flanking both sides of the low-flow channel (Photo taken 3/6/08).

MAINTENANCE HISTORY



(a) Reach 2 looking downstream from Middle Rincon Rd Crossing (top of reach). Notice the narrow low flow channel with sediment and debris deposits along the channel margins. Also, note the x-section reveals gently sloping banks with moderate canopy development (Photo taken 3/6/08).

PHYSICAL CONDITIONS

Reach setting: Reaches 2 and 1 are the extent of SCWA's maintenance responsibility on Ducker Creek; reaches are relatively uniform with a narrow, straight low-flow channel flanked by sediment deposits along the channel margins; moderate slope and limited high flows appears to be preventing significant mid-channel bar formation and most sediment is deposited at crossing and along channel margins.

Active channel: 2-5 ft wide, ½ -2 ft deep

Bed sediments/texture: sand and gravel with some cobbles in Reach 2, fining downstream to sand, gravel and silt at the bottom of Reach 1; finer materials on margin bars and at crossings throughout.

Bank structure: trapezoidal engineered channel with moderate banks (2:1 or less steep) underlain with rip-rap and covered with soil and vegetation; rocks at toe and soil from banks have sloughed to create bars along channel margins (photo b); erosion seems historic in nature as very few signs of recent erosion or instability were observed.

Water quality: algae developing in multiple stagnant or slow water areas (photo d and e).

Channel processes: the limited capacity of the box culvert under Middle Rincon Rd (top of reach)

Ducker Creek – Reaches 2 & 1

appears to constrain high flows through these reaches; margin sediment bars appear to be created by both transported sediment as well as in-situ bank slumping; observations indicate that major deposition zones are associated with crossings.

Photo (c): Unnamed access crossing in Reach 2 illustrating significant deposition at constrictions. This photo shows a massive wedge of sediment at the upstream end of crossing. The wedge extends ~50 ft upstream and is significantly reducing capacity at this crossing.



BIOLOGICAL CONDITIONS

Vegetation composition: Narrow riparian woodland exists along both banks; understory is dominated by either Himalayan blackberry or other non-native forbs and vines; emergent species within the channel are limited to water plantain and sedges along channel margins (photo b) and within the channel at areas where large gaps in the canopy exist.

Riparian corridor and canopy closure: Riparian woodland has 25 to 50% canopy closure across the creek, with limited areas of no canopy; the riparian corridor is limited to a narrow strip of oaks interspersed with redwoods and eucalyptus forming a moderately dense canopy in most places.

Instream habitat: Channel is generally straight, narrow and trapezoidal with limited complexity. Small pools have formed as a result of sediment wedges near crossing and these pools were filled with algae in March of 2008 and do not appear to provide significant aquatic habitat for fish or amphibians.

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



(d) The next crossing downstream, Rinconada Dr., is also impacted by a large sediment wedge reducing capacity of the existing box culvert. This wedge extends ~150ft upstream and averages 1.5 ft above the low flow wse. Note algal mats in the foreground (photo taken 3/6/08).

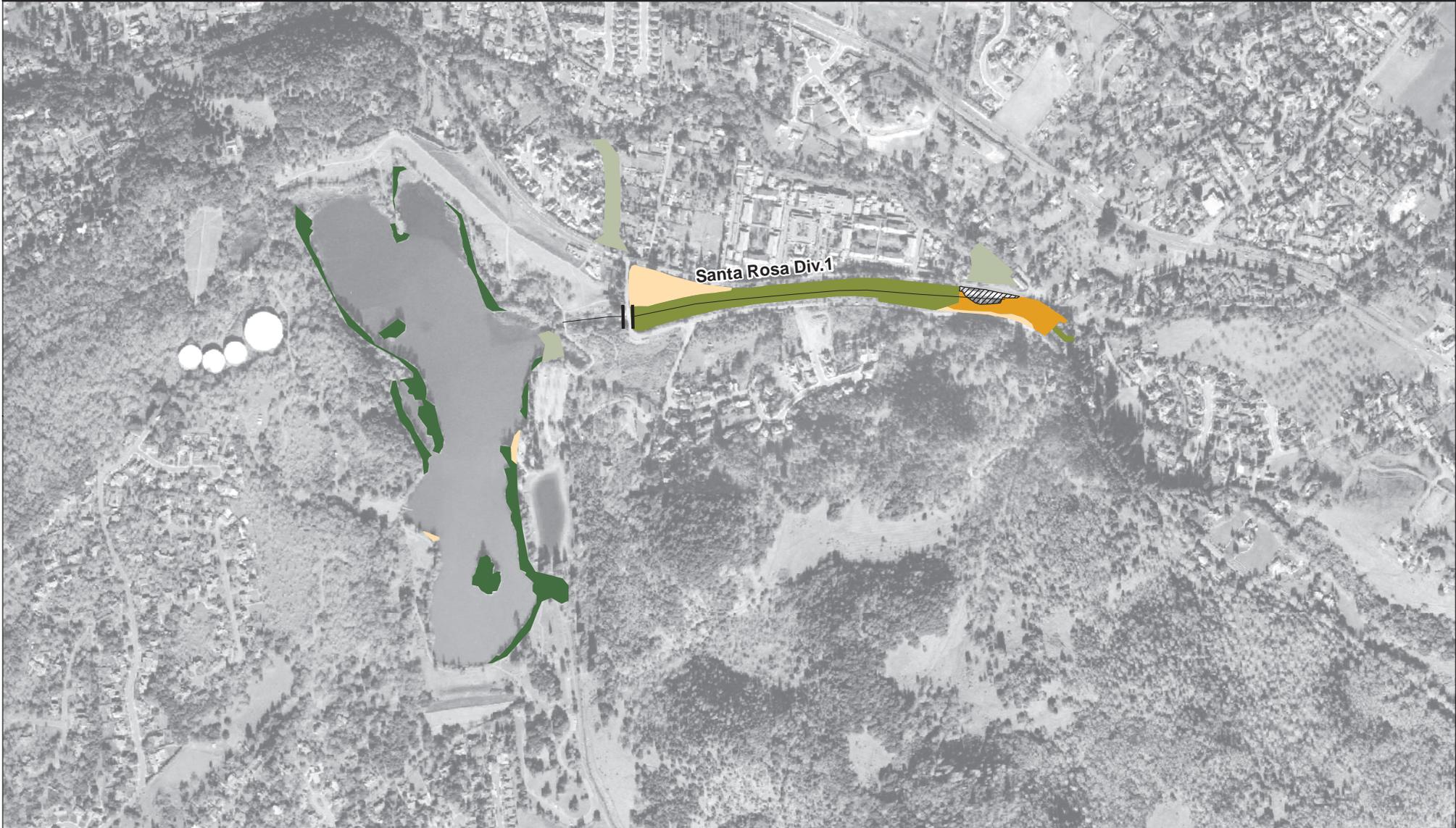


(e) Ducker Cr Reach 1, looking upstream from below the Benicia Dr. crossing. This is the largest of the three, crossing related sediment wedges. Deposition appears to be significantly impacting conveyance capacity at this crossing and has reduce by half the area of the left box. Notice algal mat in this photo as well as photo d (photo taken 3/6/08).

Ducker Creek – Reaches 2 & 1

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Reaches 2 & 1 of Ducker Creek focus on sediment removal at crossings. The Benicia crossing appears to be the most compromised at the time of writing, but the Rinconada Dr crossing should be watched carefully and the unnamed access road crossing should be watched as well. Bank slumping appears to be chronic, but limited in scope to the narrow soil profile due to the fact that nearly all banks are underlain with rip-rap.

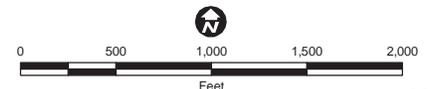


Vegetation Type

- 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 4-12
Reaches and Vegetation
Santa Rosa (3 of 13)



1 inch equals 1,000 feet

Santa Rosa Creek – Reach Div 1

JURISDICTION: SCWA owned
LOCATION: Montgomery Drive from Los Alamos Road to Channel Drive
ADJACENT LAND USE: Residential to the north, open space to the south
UPSTREAM: Santa Rosa Cr. headwaters
LENGTH: 3,169 ft
CHANNEL EASEMENT CORRIDOR WIDTH: 217 ft
AVERAGE TOP-OF-BANK WIDTH: 123 ft



(b) Concrete weir facility (near Melita Rd) that regulates discharge between Spring Lake and the downstream diversion channel. Sediment and dense vegetation collect within facility (October 8, 2008).

MAINTENANCE HISTORY



(a) Upper end of Santa Rosa Diversion Reach: Canopy is dense with heavy vegetation throughout channel (October 8, 2008).

PHYSICAL CONDITIONS

Reach setting: Diversion channel regulates discharge entering Spring Lake and continuing downstream in diversion channel. High flows from Santa Rosa Creek, immediately downstream of the Oakmont Creek confluence, are diverted into this concrete structure. Under normal flow conditions, Santa Rosa Creek is diverted through a tunnel under Montgomery Dr. and continues west along Melita Rd. Under high flow conditions, flows pass concrete weir into Spring Lake.

Active channel: Width ranges from 10 to 15 ft throughout reach. Wide uniformly flat channel bed. No low flow channel. Concrete weir facility is over 40-50 ft. wide.

Bed sediments/texture: fine sediments and sands. Weir facility collects mostly sandy sediments (photo b).

Bank structure: Concrete in sections (photo b), earthen in others (photos c and d). Relatively steep (<2:1). Banks range in height from approximately 8 to 75 feet to the bottom of the channel bed.

Water quality: Clear flows throughout. Shallow water, approximately 1-2 fpt depth range. Algae growth abundant in places receiving lots of sunlight.

Channel processes: Channel is only wet during and after storm events when flows are high enough to divert into Spring Lake. Sediment

Santa Rosa Creek – Reach Div 1

settling area at weir facility accumulates sediment and emergent vegetation quickly establishes on the bars (photo b).

BIOLOGICAL CONDITIONS

Vegetation composition: Dense blackberry and ruderal grasses dominate upstream banks. Willow and alder trees have established along the banks throughout the reach (photos b and d). Emergent wetland growth in channel ranges from approximately 100% at the upper end of the reach, decreasing to 30% near the downstream end of the reach (photos b and c).

Riparian corridor and canopy closure: Large mature trees, including eucalyptus, oak, and willow, provide 75% canopy closure throughout the reach.

Instream habitat: Poor quality habitat due to the infrequency of flows received through the reach. However, pools of standing water and dense riparian vegetation that have established on the banks provide some favorable habitat for wildlife.

Listed species with potential to occur: potential habitat for foothill yellow-legged frog and western pond turtle, known steelhead occurrence in Santa Rosa Creek upstream.



(c) Mid Reach looking downstream, wide channel over 20 ft. wide (October 8, 2008).



(d) Looking upstream from Channel Drive crossing. Banks are heavily vegetated (October 8, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations at the Santa Rosa Diversion focus on the continued maintenance of the weir facility. This facility traps abundant sediment and requires routine sediment removal that includes removal of emergent vegetation that establishes in the deposited sediment. The frequency of sediment removal at the weir facility is dependent upon climatic conditions with large rainfall years typically leading to stronger deposition at the facility. In the lower reach, vegetation management could focus on blackberry removal.



Santa Rosa Subbasin



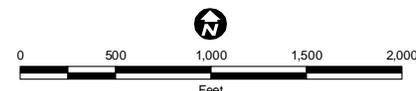
Vegetation Type

- █ 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

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

FIGURE 4-13

Reaches and Vegetation Santa Rosa (4 of 13)



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Brush Creek – Reach 1

JURISDICTION: Owned in-fee and maintained by SCWA

LOCATION: Hwy 12 to Santa Rosa Cr. confluence

ADJACENT LAND USE: Single family residential

UPSTREAM: Brush 2

LENGTH: 1,264 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 90 ft

AVERAGE TOP-OF-BANK WIDTH: 73 ft



(b) Reach 1, approximately 150 ft downstream from the Hwy 12 bridge. This unusual shaped bar formation, demarcated by the ring of gravel stretching from bank to bank and covered with cattails, forms a pool at the downstream terminus of surface flow. Downstream of this bar, the channel was completely dry until its confluence with Santa Rosa Creek (Oct. 2008).

MAINTENANCE HISTORY



(a) Looking downstream from Hwy 12 crossing. This is the only portion of the channel that maintained surface flow in October 2008. The channel maintained this appearance for approximately 150 ft until the surface flow hits a large gravel bar and goes subsurface until it reemerges at the confluence with Santa Rosa Creek.

PHYSICAL CONDITIONS

Reach setting: Reach 1 flows in a southeasterly direction from Hwy 12 to the confluence with Santa Rosa Creek. This reach is straightened and appears to maintain a moderate gradient as the bed substrate is dominated by cobbles, gravels, and fine sands.

Active channel: 10-14 ft wide between steep rocky banks ~8-16 ft high; water depth between 0-1.5 ft., ~75% of the reach dry in Oct 2008 (photo c).

Bed sediments/texture: local bedrock, boulders, gravels and some coarse sands (photos b and c).

Bank structure: slopes are generally around 1:1 (photo a) with large rocks and bedrock along the toe of slope and on the banks.

Channel processes: Whereas Reach 2 shows significant signs of deposition, aside from the large bar approx 150 ft downstream of Hwy 12, there are no major bars in Reach 1. It is possible that both the Hwy 12 crossing and the increased gradient in Reach 1 have contributed to this reduction in deposition. Also, the lower portion of Reach 1 was restored to provide habitat for steelhead trout.

Water quality (qualitative): moderate in October 2008.

Brush Creek – Reach 1

BIOLOGICAL CONDITIONS

Instream habitat: Although Brush 1 is straightened and highly engineered, recent restoration efforts have created a channel full of complexity. Woody debris has been left intact and at least 4 large wood structures or root wads were observed in the channel. Also, existing bedrock and large boulders throughout the reach create additional complexity and provide refuge for fish during high flows. Aquatic habitat conditions in October 2008 were poor due to lack of water, but the channel has the basic elements for complexity.

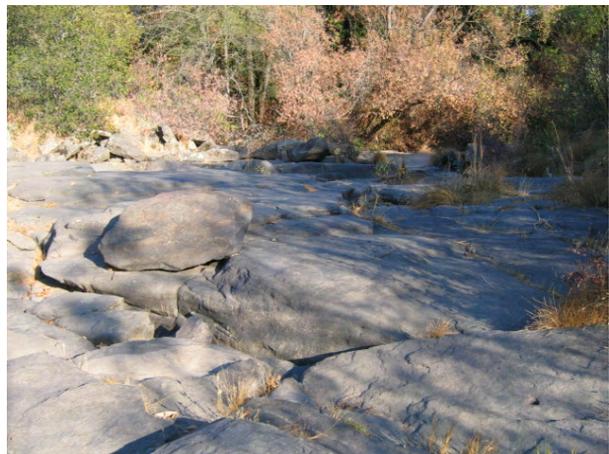
Vegetation composition: Channel vegetation is dominated by a line of willows and alders along the toe of the bank. In channel herbaceous vegetation consists of stands of rushes and sedges as well as annual grasses, various forbs and one dense stand of cattails on the sediment bar near the top of the reach. The low flow channel maintained significant bare areas.

Riparian corridor and canopy closure: 15-20 ft. wide corridor on each bank with canopy trees growing from the toe of slope, the mid-bank, and top of bank; canopy closure is moderate and ranges from about 10% to 50%.

Listed species with potential to occur: known occurrence of western pond turtle and steelhead, channel is a migratory corridor.



(c) Looking downstream from the channel bottom just upstream of the pedestrian bridge. Note that the channel is completely dry (October 2008) with no pools or other signs of surface flow. Also notice the size of the substrate in the channel as it is dominated by boulders, cobbles, gravels and bedrock outcroppings.



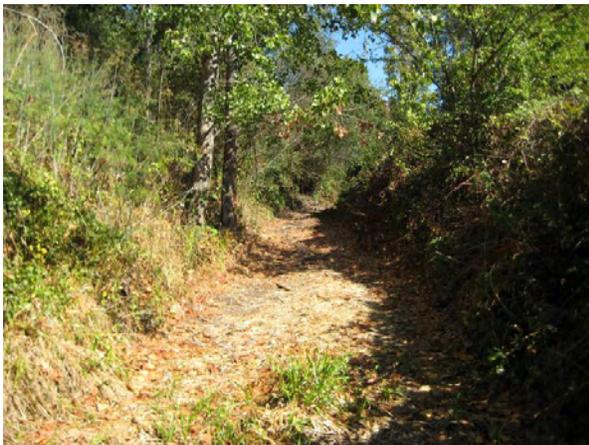
(d) Just upstream of the confluence of Brush Creek and Santa Rosa Creek. At the confluence, Brush Cr flows over a surface of flat rocks before it enters Santa Rosa Creek. Aside from the surface water observed in the first 75 ft of Reach 1, the only other surface water observed in October 2008 was at the downstream edge of the rock outcrop at the confluence with Santa Rosa Creek.

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Brush Creek Reach 1 focus on removal or modification of the sediment bar/wedge just downstream of the Hwy 12 crossing. Other than this, the reach appears to be in good condition from both a flood control and habitat perspective.

Spring Creek – Reach 3

JURISDICTION: SCWA owned
LOCATION: Idaho Drive to Colorado Blvd, approximately
ADJACENT LAND USE: Single family residential, parks/schools, and open space
UPSTREAM: Headwaters
LENGTH: 3,012 ft
CHANNEL EASEMENT CORRIDOR WIDTH: 27 ft
AVERAGE TOP-OF-BANK WIDTH: 35 ft



(b) View of the area upstream from the confluence with Sierra Park Creek, recently cleared of vegetation (October 8, 2008).

MAINTENANCE HISTORY



(a) Mid-reach view upstream. Note riprap along south bank and dense blackberry growth on north bank (October 8, 2008).

PHYSICAL CONDITIONS

Reach setting: Small tributary system emerging from alluvial fan within Bennett Valley. Flows likely transmitted through system in pulses and water is not retained within the channel for long.

Active channel: 6-8 ft wide throughout. No low flow channel or instream benches.

Bed sediments/texture: Cobbles and coarser sediments upstream, progressing to fine sands and clays downstream.

Bank structure: banks are earthen and steep; slopes range from 2:1 to near vertical. Banks are approximately 10ft high (photo a). Some areas have been stabilized with rip rap (photo a).

Water quality: No flowing water was observed on 10/8/08. Water observed in ponds further downstream near Yulupa Avenue on 12/16/08 after 2 days of rain.

Channel processes: Channel conveys small flows and sediment pulses from headwater areas, Spring Creek, and surface runoff. Evidence of past bank instability may indicate erosive forces sometimes occur in large storm events.

Spring Creek – Reach 3

BIOLOGICAL CONDITIONS

Vegetation composition: Himalayan blackberry dominates banks throughout the reach, providing nearly full cover (photos a and b). Mixed riparian wetland species cover approximately 15% of the in-channel area where vegetation was not recently cleared (photo b).

Riparian corridor and canopy closure: California bay laurel, redwood, alder and other mature trees along the bank corridor provide a canopy cover of up to 50% (photo b).

Instream habitat: Poor quality instream habitat due to modified nature of channel and surrounding area.

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



(c) Looking downstream at confluence with Sierra Park Creek shows heavy vegetation in channel and along banks (October 8, 2008).



(d) The Yulupa Avenue crossing of Spring Creek, downstream from Reach 3 (December 16, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Continue to maintain channel free of vegetation, especially at culvert inlets and outlets. Monitor streambed for accumulation of fine sediments between cobbles, which could reduce infiltration. Consider installing a low flow channel to encourage sorting of bed sediments.

Spring Creek – Reach 1

JURISDICTION: Owned in-fee and maintained by SCWA

LOCATION: Farmers Lane (Hwy 12) to Doctor's Park Dr., 500 ft. west of Hoen Ave.

ADJACENT LAND USE: Commercial and single family residential

UPSTREAM: 2,000 ft. non-maintained reach, then Spring 3 further upstream

LENGTH: 1,455 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 51 ft

AVERAGE TOP-OF-BANK WIDTH: 59 ft



(b) Looking downstream from Hwy 12 creek crossing. Note dense vegetation on both banks (October 8, 2008).

MAINTENANCE HISTORY



(a) Looking upstream from Hwy 12, entire channel is heavily vegetated (non-SCWA maintained) (October 8, 2008).

PHYSICAL CONDITIONS

Reach setting: Reach is upstream of Matanzas Creek confluence. Creek is incised into historic alluvium deposits. Flows are modified due to upstream development, including the Spring Lake reservoir.

Active channel: 20 ft wide at the Hwy 12 crossing; narrows to 15 ft wide at the downstream end of the reach (photo d). In-channel bars in the low-flow channel (photo c).

Bed sediments/texture: fine silts and clays throughout reach. Uniform deposition except small in-channel bars noted in channel (photo c). No exposed bedrock.

Bank structure: earthen with steep slopes (<2:1) at the upstream end; broadens to 3:1 further downstream (photo c). Bank height is approx 50 ft. at the Hwy 12 crossing and 10 to 15 ft high in the middle of the reach. Exposed tree roots at the toe of the banks. Hardened banks in some locations (photo b).

Water quality: clear flows and slow moving water observed on December 16, 2008 after 2 days of moderate rain. Large articles of trash, including garbage bags, oil drums, and buckets observed in channel (photos c and d).

Channel processes: riparian buffer on both sides of the channel is wider in this reach compared to reaches upstream. This added width has allowed a floodplain bench to be maintained along the channel corridor (photos c and d).

Spring Creek – Reach 1

BIOLOGICAL CONDITIONS

Vegetation composition: Understory - English ivy, blackberry, patches of bamboo, and willows. Overstory – alder, oak, redwood, and California bay trees.

Riparian corridor and canopy closure: Riparian corridor fully vegetated on both sides of the bank through the entire reach. 25% canopy closure at upstream end (photo b), 75% canopy closure at the downstream end of the reach (photos c and d).

Instream habitat: Moderate to poor quality instream habitat due to lack of substrate diversity, abundant invasive vegetation, surrounding urbanization, and poor water quality.

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



(c) Downstream end of reach, looking upstream. Note overhanging alder trees and small in-channel bar (December 16, 2008).



(d) Downstream end of reach, looking downstream. Note rusty oil drum in the channel (December 16, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Stream management in Spring 1 should focus on the removal of in-channel trees with horizontal limbs that are overhanging and crossing the channel (photo c). Such limbs can increase water levels due to their catching of debris and vegetation during higher storm flows resulting in flow blockage. Over the longer term, reach should be managed for removal of abundant invasive plants, particularly observed on the floodplain benches shown in photos c and d. SCWA crews can also remove trash as needed during periodic reach inspections.



Santa Rosa Subbasin

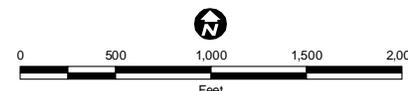


Vegetation Type

- 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

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

FIGURE 4-14
Reaches and Vegetation
Santa Rosa (5 of 13)



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Sierra Park Creek – Reach 3

JURISDICTION: SCWA owned and SCWA Easement
LOCATION: Siskiyou Road to Hoen Avenue
ADJACENT LAND USE: Single-family residential
UPSTREAM: Headwaters
LENGTH: 2,349 ft
CHANNEL EASEMENT CORRIDOR WIDTH: 62 ft
AVERAGE TOP-OF-BANK WIDTH: 55 ft



(b) Looking upstream at the middle of the reach. Creek on right, pedestrian path and Arroyo Sierra Drive on left (December 16, 2008).

MAINTENANCE HISTORY



(a) Looking upstream from Siskiyou Road (upstream of Reach 3). Stream enters large 10 ft wide by 3 ft tall box culvert. Culvert was clear of sediment. (December 16, 2008).

PHYSICAL CONDITIONS

Reach setting: Small tributary emerging from the Bennett Valley alluvial fan. Narrow corridor protected from development. Sediment transport reach. Small, flashy flows transmitted through this system.

Active channel: active channel ranges between 3 and 5 ft in width, with water depths of 3-6 inches observed on 10/8/08 and slightly deeper depths observed on 12/16/08.

Bed sediments/texture: small cobbles and coarser sands at the upstream end near Siskiyou Road. Finer sands and silts at the downstream end near Hoen Avenue.

Bank structure: banks are earthen with gentle 2:1 slopes throughout. Bank height is approximately 8 ft along left bank of the reach, while the right bank is 2-3 ft at the upper bench (pedestrian path). Top of bank widths vary from 10 to 40 ft.

Water quality: clear water observed in ponds on 10/8/08 and flowing on 12/16/08, after 2 days of rain. Trash noted in channel at both creek crossings. Oily sheen observed at the upstream end of the Hoen Avenue culvert.

Channel processes: low flow, trapezoidal channel with some sinuosity. A sediment wedge has formed at the downstream end of the culvert at Siskiyou Road.

Sierra Park Creek – Reach 3

BIOLOGICAL CONDITIONS

Vegetation composition: banks are dominated by annual grasses and ruderal vegetation, including blackberry and fennel. Approximately 90% of the in-channel area is covered with invasive vegetation.

Riparian corridor and canopy closure: A few young redwood and oak trees line the left bank primarily. These trees provide limited shading, approximately 20%, over the channel.

Instream habitat: poor quality habitat for aquatic species.

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



(c) Looking upstream from Hoen Ave., downstream from photo (b). Bank is lined with riprap immediately upstream of the culvert at Hoen Avenue. Good water quality and flows were observed on October 8, 2008.



(d) Looking downstream to Hoen Avenue culvert. Sediment and emergent vegetation accumulating on right bank, but does not obstruct flow in the active channel (December 16, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Removal of the sediment wedge at Siskiyou Road is recommended, but not urgent. Removal of blackberry throughout the reach, but particularly near the Siskiyou Road crossing is recommended. Consider planting native emergent and riparian plants throughout.

Sierra Park Creek – Reaches 2 & 1

JURISDICTION: SCWA owned

LOCATION: Sierra Park 2 – Hoen Avenue to Mayette Avenue, excluding 300 ft section through open space
Sierra Park 1 – Confluence with Spring Creek to 400 ft upstream, near Princeton Drive

ADJACENT LAND USE: Single family residential

UPSTREAM: Sierra Park Reach 3

LENGTH: Sierra Park 2: 519 ft.
Sierra Park 1: 403 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Sierra Park 2: 61 ft.
Sierra Park 1: 70 ft.

AVERAGE TOP-OF-BANK WIDTH: Sierra Park 2: 39 ft.
Sierra Park 1: 55 ft.



(b) Looking downstream along Reach 2, just north of the open space at the upstream most end of the reach. Channel is on the left. Note the abundant ruderal vegetation and lack of canopy cover (December 16, 2008).

MAINTENANCE HISTORY



(a) Mayette Avenue culvert at Reach 2, looking downstream. Box culverts were clear of sediment but trapped lots of trash (December 16, 2008).

PHYSICAL CONDITIONS

Reach setting: Lowermost end of a small tributary emerging from the Bennett Valley alluvial fan. Narrow corridor protected from development. Gentle gradient throughout both reaches.

Active channel: Width of active channel is approximately 4-5 feet. Channel appears clear of sediment and there are no bars.

Bed sediments/texture: Finer sediments and silts. No wedge above the culvert.

Bank structure: Trapezoidal channel with flood bench on right bank. Earthen banks with gentle slopes (2:1) and heights of 4-6 ft.

Water quality: water was not observed in these reaches, except some standing water at the Mayette Avenue crossing. Accumulated trash at the Mayette Avenue culvert. Many feral cats observed on 12/16/08 which may negatively influence water quality.

Channel processes: linear trapezoidal channel with very little sinuosity. Channels are largely free of sediment, but as shown in photo b, in-channel vegetation is accumulating in Reach 2.

Sierra Park Creek – Reaches 2 & 1

BIOLOGICAL CONDITIONS

Vegetation composition: annual grasses and blackberry growth dominate banks along both reaches. Mixed riparian wetland species cover approximately 60% of the in-channel area in patches; some sections of Reach 1 were recently cleared of vegetation (photo d).

Riparian corridor and canopy closure: 20% canopy cover is provided from various alder, willow, and other tree species found in patches along the corridor (photos c and d).

Instream habitat: Poor habitat quality, with little instream complexity.

Listed species with potential to occur: Western pond turtles in pools.



(c) Reach 1 mid-reach, looking upstream at canopy cover. Note emergent grasses on both sides of the bank (October 8, 2008).



(d) Looking downstream Reach 1 towards the confluence with Spring Creek (October 8, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Additional riparian tree planting and further in-channel vegetation removal. Monitor culvert crossings for accumulated trash.



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 4-15
Reaches and Vegetation
Santa Rosa (6 of 13)



1 inch equals 1,000 feet

Lorna Dell Creek – Reach 1

JURISDICTION: Owned-in fee by SCWA

LOCATION: From Tachevah Drive crossing to bridge crossing

ADJACENT LAND USE: Multi-family residential (to the east), school and park (to the west)

UPSTREAM: Lorna Dell modified channel (not SCWA-maintained)

LENGTH: 916 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 43 ft

AVERAGE TOP-OF-BANK WIDTH: 30 ft



(b) Few trees are found along the corridor, however vegetation is dense along the bank adjacent to residential area (October 8, 2008).

MAINTENANCE HISTORY



(a) Looking upstream from the Tachevah Dr road crossing (October 8, 2008).

PHYSICAL CONDITIONS

Reach setting: channel is set in the middle of an urbanized area of Santa Rosa.

Active channel: concrete-lined trapezoidal channel, 10 ft width with a water depth of approximately 6 in.

Bed sediments/texture: entire reach bed is lined concrete.

Bank structure: banks are also concrete with a slope of 2.5:1. Top of banks are approx 10 ft above bed.

Water quality: clear water and low flows observed.

Channel processes: Linear, engineered trapezoidal channel.

Lorna Dell Creek – Reach 1

BIOLOGICAL CONDITIONS

Vegetation composition: Narrow corridor of woody vegetation (such as Christmas berry) is found along top of bank adjacent to concrete channel. Emergent wetland species such as cattails and grasses cover approximately 60% of the in-channel area.

Riparian corridor and canopy closure: Limited cover (0-5%) is provided by the few willow, eucalyptus, and oak trees along the corridor.

Instream habitat: Extremely limited quality habitat due to lined channel and lack of well developed instream structure or vegetation.

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



(c) Looking downstream from the bridge crossing. Note in-channel vegetation and limited canopy cover (October 8, 2008).



(d) Vegetation growth along the reach is limited to the concrete lining of the banks and channel (October 8, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Periodic removal of accumulated sediment and in-channel vegetation will be necessary. Opportunities for improving ecological conditions are limited considering the concrete-lined channel. Additional tree planting for greater canopy cover along top of banks is possible, and could help moderate water temperatures and reduce nuisance in-channel growth.



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 4-16
Reaches and Vegetation
Santa Rosa (7 of 13)



Piner Creek – Reaches 8 & 7

JURISDICTION: Owned in-fee by SCWA

LOCATION: Reach 8: ~200 ft of channel just upstream of Santa Rosa city limits, west of Hwy 101
Reach 7: Airway Dr. to Hopper Ave.

ADJACENT LAND USE: Hwy 101 to the east and commercial office park to the west

UPSTREAM: Culvert under Hwy 101

LENGTH: Piner 8: 463 ft.
Piner 7: 1,261 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Piner 8: 53 ft.
Piner 7: 81 ft.

AVERAGE TOP-OF-BANK WIDTH: Piner 8: 46 ft.
Piner 7: 56 ft.



(a) Piner Cr. Reach 8 looks more like a seasonal swale than a typical flood control channel. Reach 8 was mostly dry in Aug 2008 with stands of cattails where the channel was still wet. The narrow channel includes rip-rap on the bed and banks (August 2008).

PHYSICAL CONDITIONS

Reach setting: East of Hwy 101 Piner Cr. drains suburban developments and grasslands before reaching Hwy 101. At 101, the channel becomes a series of swales/culverts, becoming a more typical flood control channel by mid Reach 7.

Active channel: ~1-2 ft wide in Reach 8 increasing to ~4-8 ft wide in Reach 7 with surface water depths from 0" -2' (photo b, c and d).

Bed sediments/texture: Reach 8 generally mud and organic matter on the bed with some sloughed rip-rap; Reach 7 eroded rip-rap and silts.

Bank structure: slopes are steep from 1:1 to vertical with either rip-rap or earthen banks (photo a and b).

Channel processes: Piner 8 and 7 are both straightened, engineered channels with Reach 7 conveying greater flow than 8. Lower sections of Reach 7 have sediment bars and pool sequences (photo d). Reach 7 has several eroding banks, with depositional bars forming at the toe of slope.

Water quality (qualitative): poor with surface water generally stagnant, brown and full of algae in August 2008.



(b) Upper Reach 7 looking downstream: linear, trapezoidal channel is dry and choked with rushes and grasses. Several recent additions of rip-rap along banks (see left bank below the second tree) (August 2008).

Piner Creek – Reaches 8 & 7

BIOLOGICAL CONDITIONS

Instream Habitat: Aquatic habitat in Reach 8 is limited to a few very small shallow pools during the dry season, and a sequence of pools/swale in the winter, temporarily detaining runoff. Reach 7 has very limited aquatic habitat along the upper 350', and the lower reach is dominated by shallow, stagnant water and small pools. Sediment deposits and toe-of-bank bars do provide limited complexity to the channel.

Vegetation composition: These reaches support a narrow and sparse riparian corridor along the immediate bank; the corridor becomes more vegetated moving downstream; with sparse oaks, maples, weeping willows, and acacia and the understory is dominated by bare dirt, teasel, blackberry, and annual grasses (photos b/c). Instream vegetation is dominated by cattails and tules with grasses growing on larger sediment bars (photo d).

Riparian corridor and canopy closure: 0-10ft. wide corridor on each bank with very limited canopy closure ranging from 0% (dominant case) to 25% (rare). The higher canopy coverage is at lower Reach 7.

Listed species with potential to occur: salmonids are not known from these reaches and occurrence is unlikely due to lack of spawning or rearing habitat. Reach 8 contains significant burrows and is adjacent to grasslands that could support California tiger salamander.



(c) Lower Reach 7 looking upstream. Eroded rip-rap extends into channel; several rip-rap banks appear unstable in many locations; water quality appears poor with brown stagnant water and extensive algal growth (August 2008).



(d) Lower Reach 7 looking downstream toward the Hopper Ave. Bridge. Photo shows transition between an open water pool and a large, vegetated (with grasses) sediment wedge approx 2-3 ft high; this deposit stretches from the Hopper Ave Bridge 75 ft. upstream (August 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

There are no urgent management considerations for Piner Creek Reach 8 at this time. Management considerations for Piner Creek Reach 7 include periodic inspection of banks for instability and focused sediment removal upstream of Hopper Ave. The current sediment wedge upstream of Hopper Ave. extends nearly 75 upstream and ranges from 2-3 ft. in height. Vegetation management may be necessary in Reach 7 if extensive cattail and tule growth impedes flow through the channel. Since these reaches do not appear to support much biological diversity, enhancements such as increased canopy might benefit an array of riparian species.

Piner Creek – Reach 6

JURISDICTION: Owned in-fee by SCWA
LOCATION: Hopper Ave. to Piner Rd.
ADJACENT LAND USE: Dense residential to west and industrial to east
UPSTREAM: Piner Creek Reach 7
LENGTH: 3,889 ft
CHANNEL EASEMENT CORRIDOR WIDTH: 68 ft
AVERAGE TOP-OF-BANK WIDTH: 42 ft



(b) Mid Reach 6, looking upstream at sloughing bank to right. Mid channel bar formed from eroded bank materials. These features are common along Reach 6 where instable steep banks erode into the channel (August 2008).

MAINTENANCE HISTORY



(a) Upper Reach 6 looking downstream from Hopper Ave bridge. Sediment deposit observed upstream of Hopper Ave (Reach 7) extends into Reach 6 (August 2008).

PHYSICAL CONDITIONS

Reach setting: Reach 6 is a long, straight reach flowing north to south through the Santa Rosa Plain, with a trapezoidal cross section. The channel gradient is low with flow nearly stagnant in August 2008.

Active channel: 10-12 ft wide, 6-8 ft. channel depth below banks, with flow depths ranging from 8"-12" along most of the channel (photo b and c).

Bed sediments/texture: mix of eroded rip-rap and fine sediments (photo c).

Bank structure: slopes are generally steep between 1:1 and near vertical with either rip-rap and soil or grouted rip-rap (photo a and d).

Channel processes: a linear and low gradient channel, deposition of fine sediments is observed in several mid channel bars, and locations with eroded rip-rap from adjacent banks.

Water quality (qualitative): poor with surface water generally stagnant, brown and full of algae in August 2008.

Piner Creek – Reach 6

BIOLOGICAL CONDITIONS

Instream Habitat: Habitat in this reach is limited by engineered channel conditions and bank instability. Like other reaches in the Program Area, this reach includes several sequences of sediment wedges/bars with alternating pools. In Reach 6, the pools were all shallow, warm and maintained limited complexity (photo c). A few of the pools observed in August 2008 were teeming with warm fish such as Gambusia and various minnows. This reach does not appear to support habitat for rearing salmonids and unlike Reach 8, does not contain significant burrows in the banks.

Vegetation composition: The reach supports a narrow riparian corridor along the immediate bank consisting of a mix of woody species such as liquid amber, sycamore, eucalyptus, weeping willow, and coast live oak. Understory is dominated by blackberry, teasel, fennel and annual grasses (photo a and d). Instream vegetation includes ludwigia, cattails, tules, and blackberries.

Riparian corridor and canopy closure: 10-15 ft. wide corridor intermittent on each bank with limited canopy closure ranging from 0% to 25% with the typical canopy cover condition at approximately 10%.

Listed species with potential to occur: salmonids are not known from this reach and occurrence is unlikely due to lack of spawning or rearing habitat. Unlikely habitat for other listed species as well.



(c) Lower Reach 6, looking downstream. Example of bar/pool sequence, where bar again seems to be related to slow sloughing of the bank above. Also note the brown stagnant water upstream of the bar in foreground (August 2008).



(d) Lower Reach 6 near Piner Lane. This section contains several eroding banks, with sediment and riparian sloughing into channel below (August 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Piner Creek Reach 6 include bank stabilization in the lower reach and sediment and in-channel vegetation removal at key bars throughout the reach. This reach should be surveyed for priority bank stabilization work. Additional enhancements such as increased canopy cover and bank vegetation might increase the strength and resistance of these banks to shear. This reach may experience elevated runoff velocities due to fast runoff from adjacent developed lands, and this may contribute to the bank erosion; alternatively, it may just be that bank soils/earth are not as resistant as at other reaches in the Program Area.

Russell Creek – Reaches 2 & 1

JURISDICTION: Owned in-fee by SCWA

LOCATION: Reach 2: Mendocino Ave to ~ Hwy 101
Reach 1: Range Rd to Piner Cr confluence

ADJACENT LAND USE: Dense development of industrial, commercial and residential

UPSTREAM: No upstream watershed

LENGTH: Russell 2: 1,202 ft.
Russell 1: 3,359 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Russell 2: 48 ft.
Russell 1: 67 ft.

AVERAGE TOP-OF-BANK WIDTH: Russell 2: 41 ft.
Russell 1: 39 ft.



(b) Top of Russell Reach 1 looking downstream from culvert. Open flowing section of Russell seen in foreground and section packed with cattails seen in far background (August 2008).



(a) Mid Reach 2, looking downstream toward Hwy 101. Right bank is slumping into channel, this condition is observed throughout reach. Access road seen to right (August 2008).

PHYSICAL CONDITIONS

Reach setting: Local tributary to Piner Creek. Reach 2 and 1 are both straightened and tightly confined by adjacent land-use (photo d); Reach 2 is smaller than Reach 1 and appears to carry far less water. The reaches are separated by an underground culvert ~900 ft long and both draw flows from local runoff. The access road along Reach 1 is open to a number of auto salvage/repair shops which presents a potential water quality issue.

Active channel: 1.5-2 ft wide through most of Reach 2 (photo a), expanding to 4-8 ft wide in lower Reach 1; water depths range from 1"-6".

Bed sediments/texture: dominated by a mix of mud, silt, and eroded rip-rap in Reach 1; mud and silt in Reach 2.

Bank structure: slopes are generally between 2:1 or 1:1 with either rip-rap and soil (Reach 2) or soil (Reach 2).

Channel processes: Both reaches receive significant sediment and flows from adjacent developed areas. Both reaches are heavily confined with development within 15 ft of the top-of-banks. Sediment deposition appears to be limited in Reach 2, but large instream wedges are common in lower Reach 1. Banks in both reaches are sloughing and appear to be creating in-situ margin bars (photo a) which

Russell Creek – Reaches 2 & 1

may impede flow from outfalls along each reach. In Reach 2 the channel appears to be incising through material deposited by sloughing banks and moving that material into Reach 1.

Water quality (qualitative): poor in August 2008 with small, shallow, stagnant pools and turbid flow between pools.

BIOLOGICAL CONDITIONS

Instream Habitat: Aquatic habitat is of very low value in both reaches with limited surface flow, poor water quality and significant emergent vegetation reducing surface flow to shallow (~1") of diffuse flow in many places. Where pools do exist, they are shallow, stagnant and contain significant algae growth. Unlike Coffey Cr, a nearby tributary to Piner Cr, most of Russell Creek maintained some surface flow in August 2008.

Vegetation composition: The reaches support very limited growth of woody species with landscaped redwoods between Kaiser-Permanente and the channel in Reach 2 and a narrow corridor of oaks, pines, and maples below the top of bank in Reach 1 (photo b and d); understory in both reaches is dominated by ivy, fennel, cattails, and grasses with occasion willows along the toe of slope (photos a and c).

Riparian corridor and canopy closure: ranging from 0%-10% (dominant case) to 25% (at bottom of Reach 1).

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



(c) Mid Reach 1 grade control structure (August 2008).



(d) Lower Russell 1, looking upstream on the access road. Unlike most SCWA channels, the access road is not fenced and a number of industrial/commercial businesses encroach on the access road. A variety of old/unused and newer cars are parked along or directly adjacent to the access road. Water quality might be jeopardized by commercial and industrial uses this close to the channel (August 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Russell Creek include reduction of bank instability and scour along Reaches 2 and 1 in order to reduce bank erosion, maintain flow from outfalls, and reduce sediment transport through Russell Cr. In Reach 2, management could also focus on developing a barrier between industrial/commercial areas and the channel as this may lead to water quality issues. Canopy enhancements could benefit a suite of riparian species and retard growth of emergent vegetation.



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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 4-17
Reaches and Vegetation
Santa Rosa (8 of 13)



1 inch equals 1,000 feet

Piner Creek – Reaches 5, 4 & 3

JURISDICTION: Owned in-fee by SCWA
LOCATION: Reach 5: Piner Rd. to RR Tracks
Reach 4: RR tracks to Marlow Rd.
Reach 3: Marlow Rd. to Guerneville Rd.

ADJACENT LAND USE: Industrial at Reach 5 and Residential at Reaches 4 and 3

UPSTREAM: Piner 6

LENGTH: Piner 5: 1,380 ft.
Piner 4: 2,235 ft.
Piner 3: 4,250 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Piner 5: 78 ft.
Piner 4: 82 ft.
Piner 3: 100 ft.

AVERAGE TOP-OF-BANK WIDTH: Piner 5: 52 ft.
Piner 4: 50 ft.
Piner 3: 70 ft.



(b) Reach 5, looking downstream toward Coffee Lane crossing. Large vegetated sediment wedge extends upstream of the crossing. Lack of woody vegetation on banks; shopping cart and other nuisance trash in channel (August 2008).

MAINTENANCE HISTORY



(a) Reach 5, looking downstream from Piner Rd. crossing. Active channel is clogged with herbaceous vegetation; cattails and sediment fill the channel upstream of the Russell Cr. confluence (which is grouted rip-rap) (August 2008).

PHYSICAL CONDITIONS

Reach setting: Reaches 5 and 4 continue to flow south across the Santa Rosa Plain. Channel has a wider cross-section and more riparian canopy moving downstream. Reach 5 contains the confluence with Russell Cr, Reach 4 contains the confluence with Coffee Cr, and Reach 3 contains the confluence with Paulin Cr.

Active channel: 10-12 ft wide upstream of Paulin Cr. confluence (photos a and b) to 14-20 ft wide downstream (photo d); channel depths range from 6-10 ft in the upper sections to 10-12 ft deep below the top-of-bank in the lower sections; flow depths range from 2-18 in. (photos c/d).

Bed sediments/texture: dominated by silt and eroded rip-rap with occasional gravels and sands.

Bank structure: banks are generally between 1.5:1 to 1:1; with either soil over rip-rap or grouted rip-rap (photos b, c, d).

Channel processes: joining tributaries play a key role in these reaches, with Paulin Cr nearly doubling flow downstream. Piner Cr. reaches are straightened and trapezoidal and observations of in-channel rock at regular intervals suggests weirs were installed for grade control. The streambanks appears to be

Piner Creek – Reaches 5, 4 & 3

more stable in these reaches than upstream in reaches 6 and 7.

Water quality (qualitative): improved from Reach 6 with less stagnant water and reduced algae growth.

BIOLOGICAL CONDITIONS

Instream Habitat: Habitat in these reaches appears to improve downstream. Channel habitat is still governed by the sediment bar-pool alternating sequence, but the sediment deposits are generally smaller moving downstream, sometimes controlled by rock weirs. Also, the areas of open water are longer and larger and contain some small bars creating limited complexity. Open water areas still lack habitat complexity; increased canopy downstream provides more shade to the aquatic habitat.

Vegetation composition: The riparian corridor is wider and denser moving downstream with a mix of shrubs and trees including weeping willows, coast live oaks, and acacia with smaller arroyo willows and alders near the toe of slope or in the channel (photo c and d). Understory is dominated by fennel, blackberry, and grasses with cattails and annual grasses dominating the in-channel habitats.

Riparian corridor and canopy closure: 20-40 ft. wide corridor on each bank with increasing canopy closure ranging from 0% to 50% moving downstream, with many areas greater than 25%.

Listed species with potential to occur: all three reaches are potential habitat for western pond turtle; Central California Coast Steelhead are known to occur in Reach 3 (migratory and rearing habitat) and Paulin Cr, but not from Reaches 4 and 5.



(c) Upper Reach 4, just downstream from the RR crossing. Streambanks are grouted and the channel is indiscernible due to the extensive growth of emergent vegetation (August 2008).



(d) Reach 3 looking downstream from the Paulin Cr. confluence. Confluence is heavily rocky and grouted; cattails form a dense mat across nearly the entire channel just downstream of the confluence (in distance) (August 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

With the exception of a few small sloughing banks and 2-3 larger sediment deposits (like downstream of Marlow Rd. Crossing and downstream of the Paulin/Piner confluence) management considerations for Piner Creek Reaches 5, 4, and 3 are limited. Due to the increased habitat complexity in these reaches, maintenance or enhancement activities that increase instream pool formation, fill-in canopy in areas that where canopy is intermittent, and focus flows into a narrower and deeper low flow channel would provide benefit to rearing steelhead and a suite of other aquatic and riparian species. Reach 3 seems to have the most potential for good/enhanced instream habitat conditions.

Coffey Creek – Reach 1

JURISDICTION: Owned by City of Santa Rosa;
Maintenance easement held by
SCWA

LOCATION: Piner Rd. to Piner Cr. confluence

ADJACENT LAND USE: Residential, except for the
last 500 ft

UPSTREAM: Non-SCWA maintained reach

LENGTH: 1,118 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 74 ft

AVERAGE TOP-OF-BANK WIDTH: 60 ft



(b) Upper Coffey Cr Reach 1 about 250 ft. downstream of Piner Rd crossing. Channel has changed from blackberry thicket above (photo a) to cattails growing across the entire channel (Sept. 2008).

MAINTENANCE HISTORY



(a) Top of Coffey Cr. Reach 1 looking downstream from Piner Rd. crossing. Vegetation management activities were underway when this photo was taken in September 2008. Just downstream the entire cross section is covered by a dense thicket of blackberry with interspersed willows.

PHYSICAL CONDITIONS

Reach setting: Coffey Cr. is limited to this reach and a 400 ft non-SCWA maintained reach stretching from Piner Rd to Plum Tree Lane. Upstream of Plum Lane, there is no discernible watershed and flows appear to emanate from the railroad and from industrial and residential areas likely served by stormdrain systems to the west, north, and east.

Active channel: 1-2 ft wide upstream expanding to 2-4 ft wide downstream; dry season depths ranging 0" (dry) to isolated pools to 6" (photo c).

Bed sediments/texture: dominated by a mix of sand, silt, and rip-rap.

Bank structure: slopes are generally very gentle at the upstream end (photo a) and transition to much steeper (~ 1:1 in photo b); with rip-rap overlain by soil throughout.

Channel processes: Coffey Creek is a small system with a limited watershed. This reach is low gradient with a narrow double barrel culvert crossing at its confluence with Piner Cr; this crossing is heavily impacted by deposition of fine sediment as is most of the lower portion of the reach.

Water quality (qualitative): mostly dry in August 2008, with shallow, stagnant, pools with poor water quality.

BIOLOGICAL CONDITIONS

Coffey Creek – Reach 1

Instream habitat: Aquatic habitat in this reach is limited by the lack of water in the summer (much of the reach was dry in August 2008). Where surface water exists in the summer, it flows in a diffuse pattern through dense cattails and blackberries. This reach does maintain a few pools through the summer (photo c), but the water quality appears to be very poor and the pools are shallow (max 6"). In channel bars and margin bars do provide a small bit of complexity to the channel, but this system does not appear to provide any high or moderate quality aquatic habitat.

Vegetation composition: The reaches support a narrow and very sparse riparian corridor stretching from the toe of slope to the top of bank which consists of blackberry thicket (recently removed in photo a) with a mix of small arroyo willows, occasional oaks and walnuts growing above the top of bank (photo b and c).

Riparian corridor and canopy closure: woody riparian corridor ranges from 0-25 ft wide on each bank with canopy expanding in width moving downstream; very limited canopy closure ranging from 0% (dominant case) to 10% (rare).

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



(c) Bottom of Coffey Cr, just upstream of confluence with Piner Cr. Reach 4. The pool in the center of the photo is one of the only pools observed along Coffey Cr. during September 2008 surveys. Notice the level of stagnation and vegetated sediment wedges both upstream and downstream.



(d) Lower Coffey Cr at culverts that cross access road and enter Piner Creek Reach 4. A large, deep, and heavily vegetated sediment wedge is deposited upstream of the culverts. There is a large pool upstream of this wedge (photo c) and surface flow appears to be almost completely blocked by the sediment wedge during low flow conditions (August 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Coffey Creek Reach 1 range from sediment removal upstream of culverts at the Piner Cr. confluence to significant vegetation management to remove cattails and blackberry choking the channel further upstream. Following sediment and vegetation removal, canopy enhancement efforts would be a valuable tool for increasing shade and riparian habitat while retarding re-growth of cattails in the channel.

Paulin Creek – Reaches 6 & 5

JURISDICTION: Owned in-fee by SCWA

LOCATION: North-central Santa Rosa, west (downstream) of Hwy 101 crossing of Paulin Creek

ADJACENT LAND USE: Paulin 6 – commercial and apartment residential; Paulin 5 – single family residential and apartment residential

UPSTREAM: Paulin modified channel upstream of Hwy 101

LENGTH: Paulin 6: 2,257 ft.
Paulin 5: 1,854 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Paulin 6: 63 ft.
Paulin 5: 85 ft.

AVERAGE TOP-OF-BANK WIDTH: Paulin 6: 43 ft.
Paulin 5: 48 ft.



(b) Reach 6 – looking downstream from Range Avenue, similar to photo a, sediment deposited downstream of crossing, in mid-distance small cattail block creates upstream ponding, bank vegetation comprised mostly of exotic/invasive species (Aug. 12, 2008).

MAINTENANCE HISTORY



(a) Reach 6 – looking downstream from McBride Lane, channel contains deposited sediment wedge extending to mid-distance, cattails and other herbaceous/emergent vegetation fill channel developing in the recent deposits (Aug. 12, 2008).

PHYSICAL CONDITIONS

Reach setting: Paulin Creek is a central tributary to Piner Creek (a lower tributary to Santa Rosa Creek); Reach 6 represents the transition from the modified channel upstream of Hwy 101 to the more linear/uniform engineered channels downstream. The surrounding land uses are urbanized, with flashy winter runoff and summer release flows. Gradient in Reaches 6/5 controlled by hardened crossings including railroad at downstream end of Reach 5.

Active channel: Reaches 6 and 5 are linear trapezoidal channels, Reach 6 active wetted channel ranges from 24-20 ft wide, with little defined low-flow channel form; Reach 5 active channel is narrower, typically 10-12 ft wide.

Bed sediments/texture: Sand dominant system, with some finer silts/muds settling in shallow ponded areas.

Bank structure: Generally earthen banks of 1:1 slope, top-of-bank height is 10-15 ft high in Reach 6, and 5-10 ft high in Reach 5; grouted rip-rap is used to fortify several bank areas, typically downstream of crossings, but in other areas too.

Channel processes: In Reach 6 depositional sediment wedges are found downstream of all crossings (mostly sand with cattails developed) indicating sediment transport occurs in pulses,

Paulin Creek – Reaches 6 & 5

and preferentially deposits in the widened benches downstream of the crossings.

Water quality (qualitative): Sediment wedges and cattails create several pools of stagnant flow,

where urban runoff has created eutrophic conditions with algae developed in still water pools. Substantial amounts of trash in Reach 6; visible trash and pollutants from dumping visible in mid-Reach 5.

BIOLOGICAL CONDITIONS

Instream Habitat: Reach 6 is characterized by a sequence of pools and sediment wedges, with wedges downstream of crossings pooling flows upstream of the crossings (photos a, b). Reach 5 continues with several shallow open water runs. Reach 5 habitat quality is reduced by visible trash and pollutants (photo d). Open water areas in Reach 5 lack habitat complexity, but increase canopy provides significantly more shade to the aquatic habitat.

Vegetation composition: Upper portion of Reach 6 and most of Reach 5 support riparian woodland vegetation, with up to 75% canopy cover (photo c). Riparian vegetation consists of a mix of shrubs and trees including weeping willows, coast live oaks, tree of heaven, eucalyptus and acacia with smaller arroyo willows and alders near the toe of slope or in the channel. Mid-Reach 6 has minimal canopy closure. Understory is dominated by fennel, blackberry, ivy, and isolated areas of pampas grass, with cattails, duckweed, ludwigia and annual grasses dominating the in-channel habitats.

Riparian corridor and canopy closure: 20-40 ft. wide corridor on each bank with good closure near Hwy 101 in upper Reach 6 and throughout most of Reach 5 (up to 75%).

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



(c) Mid Reach 5 – looking downstream, this reach enjoys good riparian canopy cover along both north and south banks, cover promotes shading and reduces cattail presence as observed in Reach 6 upstream (Aug. 12, 2008).



(d) Reach 5 – dumped trash includes shopping carts, wood, and other household refuse, pollutants include paints, other household materials, etc. (Aug. 12, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Paulin Creek Reaches 6 and 5 are focused toward the following activities: localized sediment removal downstream of the crossings in Reach 6 (including Cleveland Avenue, McBride Lane, and Range Avenue) where sediment and cattails collect (photos a/b); vegetation thinning (particularly blackberry removal) along some of the northern banks of Reach 6; and trash and pollutant removal from dump sites in mid-Reach 5 (photo d). Riparian canopy along Reach 5 is developing well, resulting in fewer cattails than in the upstream Reach 6 (photo c).

Paulin Creek – Reaches 4 & 3

JURISDICTION: Owned in-fee by SCWA

LOCATION: North-central Santa Rosa, west (downstream) of Hwy 101 crossing of Paulin Creek, upstream of Piner Creek confluence

ADJACENT LAND USE: Paulin 4 – commercial land uses, railroad crossing; Paulin 3 – single family residential and apartment residential

UPSTREAM: Paulin Creek Reach 5

LENGTH: Paulin 4: 324 ft.
Paulin 3: 1,881 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Paulin 4: 71 ft.
Paulin 3: 69 ft.

AVERAGE TOP-OF-BANK WIDTH: Paulin 4: 51 ft.
Paulin 3: 57 ft.



(b) Reach 3 downstream of Apache Street - downstream end of culverts beneath Apache Street are blocked with sediment wedge and cattail and other herbaceous growth (Aug. 12, 2008).

MAINTENANCE HISTORY



(a) Reach 4 upstream of railway crossing - commercial land use adjacent; steep vertical hardened banks, narrow channel below, abundant blackberry (Aug. 12, 2008).

PHYSICAL CONDITIONS

Reach setting: Paulin Creek is a central tributary to Piner Creek (a lower tributary to Santa Rosa Creek); in Reaches 4/3 the channel alignment shifts from east-west, to more northeast-southwest; these reaches include several southward bends which follow path of pre-channelized stream system; a railroad between Reaches 3 and 4 fixes channel elevations and sets gradients along with other downstream crossings that constrain the channel. Adjacent land uses are commercial and dense residential.

Active channel: Reach 4 has steep trapezoidal cross section, with active channel 15-20 ft deep below top-of-bank, Reach 4 wetted channel 10-12 ft wide, Reach 3 active channel is similar in width, but less incised beneath top-of-bank.

Bed sediments/texture: Sand dominant system, with some finer silts/muds settling in shallow ponded areas or stored in cattail patches.

Bank structure: Generally earthen and rip-rapped banks of 1:1 slope, locally steeper; top-of-bank height is 10-15 ft high in Reach 4, and then generally decreases through Reach 3 (5-10 ft high); grouted rip-rap is used to fortify several bank areas, at crossings, but also throughout reaches, along bends, etc.

Paulin Creek – Reaches 4 & 3

Channel processes: Several bends of Reaches 4 and 3 create turbulence and eddies, though the hardened banks prevent any significant evolution in channel form; crossings and culverts in upper Reach 3 create sediment wedges, blockages (photo b) and then downstream pools complexes.

Water quality (qualitative): Sediment wedges and cattails in upper Reach 3 create blockages, pools of stagnant flow, and trap some trash.

BIOLOGICAL CONDITIONS

Instream Habitat: Reach 4 and upper Reach 3 are highly constrained by steep hardened banks and multiple crossings. Instream habitat improves toward lower Reach 3 (photos c and d) where fewer crossings disturb the channel. Also, bank heights decrease in lower Reach 3, with increased open water runs, and small pools. Lower Reach 3 has much greater riparian canopy than upper Reach 3 or Reach 4 and provides significantly more shade to the aquatic habitat.

Vegetation composition: Reach 4 and upper Reach 3 have some riparian woodland, but blackberry, cattails, and annual grasses dominate the in-channel habitats. In lower Reach 3 riparian vegetation including weeping willows, coast live oaks, and acacia with smaller arroyo willows near the toe of slope or in the channel.

Riparian corridor and canopy closure: 20-40 ft. wide corridor on each bank with better closure at the southward bend in lower Reach 3 (photo c) and near W. Steele Ln. crossing (up to 75%).

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



(c) Mid Reach 3 – looking downstream toward section with increased riparian cover, less steep banks than upstream, and more open water runs and improved aquatic habitat with understory aquatic plants (Aug. 12, 2008).



(d) Reach 3 – looking upstream from West Steele Lane crossing, mature trees provide canopy, with understory near West Steele Lane dominated by blackberry (Aug. 12, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Paulin Creek Reaches 4 and 3 are focused toward the following activities: localized sediment removal should be assessed for areas upstream and downstream of the Apache Street culverts (photo b); vegetation thinning (particularly blackberry removal) along some of the northern banks of Reach 4 and upstream of the W. Steele Lane crossing of lower Reach 3; riparian canopy along lower Reach 3 is developing well, but tree planting opportunities should be evaluated in upper Reach 3.

Paulin Creek – Reaches 2 & 1

JURISDICTION: Owned in-fee by SCWA

LOCATION: North-central Santa Rosa from W. Steele Ln. to Marlow Rd, upstream of Piner Creek confluence

ADJACENT LAND USE: Paulin 2 – single family residential to north and Northwest Community Park open space to south. Paulin 1 – single family residential to north and school/playfields to south

UPSTREAM: Paulin Creek Reach 3

LENGTH: Paulin 2: 1,654 ft.
Paulin 1: 1,531 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Paulin 2: 85 ft.
Paulin 1: 97 ft.

AVERAGE TOP-OF-BANK WIDTH: Paulin 2: 55 ft.
Paulin 1: 58 ft.



(a) Reach 2 downstream of W. Steele Ln. crossing – trapezoidal channel with steep banks; abundant shrub growth in channel; young oaks and other trees (like Black Hawthorne) are establishing on the banks, but there is still limited shading in the upper Reach 2 (Aug. 12, 2008).

PHYSICAL CONDITIONS

Reach setting: Paulin Creek is a central tributary to Piner Creek (itself a lower tributary to Santa Rosa Creek); in Reaches 2-1 the channel alignment continues east-west toward the Piner Cr. confluence; because these reaches have only one major crossing at Marlow Rd. this results in a less interrupted and more continuous riparian setting.

Active channel: Reach 2 has a steep trapezoidal cross section, with active channel 8-10' deep below top-of-bank, and a wetted channel 10-12' wide; in Reach 1 the active channel widens to 16-20' and is less deep beneath top-of-bank.

Bed sediments/texture: Sand dominant system, with some finer silts/muds settling in shallow ponded areas or stored in cattail patches; in Reach 1 riprap cobbles sloughed from bank form small cobble patches, riffles and pools (photo d).

Bank structure: In Reach 2, generally earthen and rip-rapped banks of 1:1 slope with top-of-bank height 8-10' above channel bed; bank heights decrease downstream toward Reach 1. In Reach 1, the channel cross-section deepens again toward the Piner Cr. confluence.



(b) Mid Reach 2 – steep banked trapezoidal channel with oaks growing on southern bank (left) and blackberry and other herbaceous growth on unshaded northern bank (right); note inset bench on southern (left) bank that supports grasses; some shading beneath undercut banks to right (Aug. 12, 2008).

MAINTENANCE HISTORY

Paulin Creek – Reaches 2 & 1

Channel processes: Sediment and cattail wedges occur downstream of W. Steele Ln, and in other open/sunny locations, but generally decrease in the downstream direction; some pool/riffle sequences in Reach 1.

Water quality (qualitative): Sediment wedges and cattails in upper Reach 2 create blockages, pools of stagnant flow. Less trash than in upstream more urban reaches; finer sediments are transported through sections with steeper gradients.

BIOLOGICAL CONDITIONS

Instream Habitat: Instream habitat improves in Reaches 2 and 1, compared to upstream reaches, because fewer crossings disturb the channel. Bank heights decrease in Reach 2, but then increase again in lower Reach 1 toward the Piner Creek confluence. Riparian cover increases into Reach 1 with older established oaks along southern bank. Some stagnant flow in upper Reach 2, but into Reach 1 there are open water runs, with small pools.

Vegetation composition: Upper Reach 2 has some riparian woodland but is dominated by blackberry, cattails and annual grasses dominating the in-channel habitats (photos a/b). Into lower Reach 2 and Reach 1 riparian woodland increases, providing up to 75% canopy cover, including weeping willows, alder, coast live oaks, and acacia; grasses and shrubs seen in understory beneath tree canopy (photos b/c).

Riparian corridor and canopy closure: 25-50 ft. wide corridor on each bank, canopy cover in upper Reach 2 is up to 25% cover, and increases downstream with up to 75% cover in lower Reach 2 and Reach 1.

Listed species with potential to occur: known steelhead occurrence (reaches are migration corridor with potential rearing habitat); Coastal Chinook observed in adjacent tributary; potential habitat for western pond turtle.



(c) Reach 1 downstream of Marlow Rd. – looking downstream, channel becomes wider and shallower compared to Reach 2 upstream (more gentle trapezoidal cross section); riparian cover increases, mainly oaks; cattails and sediment wedges occur downstream of Marlow crossing but then are more rare (Aug. 12, 2008).



(d) Reach 1 just upstream from Piner Creek confluence – channel depth and area increase toward Piner Cr. confluence; rock in near ground is riprap that has sloughed from local banks; oaks and alders seen in reach providing canopy and shade (Aug. 12, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Paulin Creek Reaches 2 and 1 are focused toward the following activities: (1) localized sediment removal should be assessed for areas downstream of W. Steele Ln. (200 ft) and downstream of Marlowe Rd. (150 ft) where cattails and sediment wedges have reduced conveyance capacity; (2) blackberry removal in upper Reach 2; and (3) evaluation of tree planting opportunities along the northern bank of upper Reach 2.



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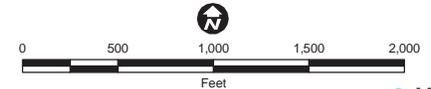


Vegetation Type

- 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 4-18
Reaches and Vegetation
Santa Rosa (9 of 13)



Steele Creek – Reach 5

JURISDICTION: Owned and maintained by SCWA

LOCATION: 750 ft upstream of Jennings Ave to Guerneville Rd.

ADJACENT LAND USE: Residential and industrial in upper section; residential in lower section; bounded by RR tracks to the north

UPSTREAM: 2 underground culverts one from the west (concrete) and one from the south (metal)

LENGTH: 2,447 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 54 ft

AVERAGE TOP-OF-BANK WIDTH: 27 ft



(b) Upper reach looking downstream: Narrow channel is completely choked with cattails and grasses and the cross-section is wide and shallow. As Steele Cr flows toward Jennings Ave, the channel deepens and the thalweg opens (see photo c) (Nov. 2007).

MAINTENANCE HISTORY



(a) Beginning of Steele Creek at top of Reach 5: concrete culvert extends at least 500 ft beyond Range Ave.; A second culvert enters channel from the south (only the second culvert was flowing in November of 2007). Upstream of these culverts there is no discernible channel (Nov. 2007).

PHYSICAL CONDITIONS

Reach setting: located along lower alluvial plain downstream of Hwy 101, creek drains directly into Santa Rosa Cr at Reach 1; upstream the channel is in an underground culvert and there appears to be little connection with uplands.

Active channel: channel bed is 3-6 ft. wide upstream widening downstream to ~8 ft.; intermittent surface flow observed upstream of Jennings Ave, shallow, perennial below; banks 2-3 ft high at top of reach gradually increasing in height to 8-10 ft at Guerneville Rd.

Bed sediments/texture: generally finer textured sediments with relatively high organic content;

Bank structure: linear trapezoidal channel with earthen banks sloped from 1.5:1 to 1:1.

Water quality: shallow diffuse flows through cattails in upper section, below Jennings Ave. water is flowing and it does not appear stagnant.

Channel processes: linear channel alignment with flows generally contained within engineered banks; channel disconnected from upper watershed by long 24" culverts. Channel collects local flows and sediment through stormdrains; increased channel gradient between Jennings Ave and Guerneville Rd appears to move most sediment through the reach.

Steele Creek – Reach 5

BIOLOGICAL CONDITIONS

Vegetation composition: The majority of the reach consists of ruderal grassland or blackberry along banks. There is a linear band of riparian woodland just upstream of Jennings Ave. to about 250 ft. downstream (photo c) with limited closure. The upper banks support a variety of different tree species including oaks, firs, maples, etc.

Riparian corridor and canopy closure: Canopy cover is scarce in most sections (photo a, b and d) and moderate to heavy in only one (photo c). Cattails and emergent vegetation choke the channel in sections with limited canopy closure, whereas areas with high canopy/shade contain significantly less emergent vegetation.

Instream habitat: Although the channel is straight and trapezoidal, it does contain a scoured low flow channel with persistent open water. Aquatic habitat is limited to shallow glide habitat with no pools, riffles, cut banks, or other habitat features.

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



(c) Looking downstream from Jennings Ave pedestrian crossing. Unlike the upper channel in photo b, there is a visible thalweg from this point downstream, the channel is set deeper with top of bank ~10-12 ft from channel bottom, and a narrow riparian corridor flanks the north side of the channel. This riparian corridor thins to sparse trees moving downstream (Nov. 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

There did not appear to be any pressing management needs at the time of the assessment (11/07). Although the upper reach section is filled with cattails, there does not appear to be enough water moving through that system to warrant attention at this time. The upper section of this reach could benefit from additional plantings along the south and north banks. Additional plantings through much of the reach would increase habitat and provide shade to lower water temperatures and reduce growth of cattails.

Steele Creek – Reaches 4 & 3

JURISDICTION: Owned and maintained by SCWA

LOCATION: Reach 4: Guerneville Rd. (just upstream of N. Dutton) to Guerneville Rd. (just upstream of Ridley Ave)

Reach 3: Guerneville Rd. (just upstream of Ridley Ave) to Ridley Ave crossing.

ADJACENT LAND USE: Residential to south, Guerneville Rd. to north

UPSTREAM: Steele 5 (90 degree turn at Guerneville Rd. into Reach 4).

LENGTH: Steele 4: 2,643 ft.

Steele 3: 626 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:

Steele 4: 48 ft.

Steele 3: 59 ft.

AVERAGE TOP-OF-BANK WIDTH: Steele 4: 41 ft.

Steele 3: 48 ft.



(b) Looking upstream from Lance Dr. crossing. This crossing consists of three 24" culverts set in rock and earth. The crossing is clearly a hydraulic constraint and is forcing sediment to settle out and build a wedge upstream of the crossing. Note the lack of canopy near the crossing and the extent of cattail growth in the channel (Nov. 2007).



(a) Looking upstream to culvert and drop structure - energy dissipater at 90° turn at Guerneville Rd. A large pool has formed downstream of the structure, the structure does not appear in need of immediate maintenance (Nov. 2007).

PHYSICAL CONDITIONS

Reach setting: After taking a 90° turn from Reach 5, Reach 4 flows along Guerneville Rd for its entire length, making a southward 90° turn at the top of Reach 3 and a final bend westward at the bottom of Reach 3. Aside from three sharp turns, the channel is straight and trapezoidal for most of its distance.

Active channel: 6-8 ft wide; inset ~10 ft deep from top of bank; water depths range from 0.5-2 ft; flow is perennial.

Bed sediments/texture: generally finer textured sediments with high content of silts and muds; rip-rap and some grouted rip-rap along the bed in isolated sections.

Bank structure: linear trapezoidal channel with most banks earthen and sloped from 1.5:1 to 2:1; rip-rap and grouted rip-rap at bends and crossings.

Water quality: turbid throughout; dominated by moving open water with occasional slack water and stagnation upstream of crossing.

Channel processes: linear channel alignment with flows generally contained within engineered banks; energy from upstream flows is likely dissipated at the drop structure at the head of the reach; channel does not appear to be heavily impacted by reach scale deposition, but deposits that are developing at most crossings.

Steele Creek – Reaches 4 & 3

BIOLOGICAL CONDITIONS

Vegetation composition: Reach 4 is bounded by a sidewalk and Guerneville Rd to the north and residential development to the south. However, within the narrow riparian corridor, extensive woody vegetation has established from the toe of slope to the top of bank. The upper banks support a variety of different tree species including liquid amber, eucalyptus, oaks, firs, redwood, etc. Where tree species are absent fennel, annual grasses, and a variety of other herbaceous species are present (photo b).

Riparian corridor and canopy closure: There is a linear band of riparian woodland through much of Reach 4 consisting of scattered willows and alders along the toe of slope and a mix of ornamental and native trees along the banks. In Reach 3, the banks are covered by non-native grasses on both sides and then tree canopy beyond the grass (photo d). Canopy cover ranges from 25%-75% with interspersed sections of dense and scattered tree cover. Where canopy is open, cattails and emergent vegetation choke the channel (photo b)

Instream habitat: Although the channel is straight and trapezoidal, it does contain a scoured low flow channel with persistent open water. Unlike Reach 5, these reaches contain a number of aquatic habitat elements such as small pools, riffles, glides, undercut banks, and small debris jams (photo c).

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



(c) Middle of Reach 4, looking downstream from Lance Dr. crossing. The channel is open and flowing, but barely visible with the dense cover of fennel and a variety of native and non-native trees and shrubs (Nov. 2007).



(d) Near bottom of Reach 3, looking upstream toward Guerneville Rd. (red car in background). The channel is straight and banks are covered by ruderal grasses with an open, mixed canopy from a variety of tree species (Nov. 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

There did not appear to be any pressing large scale management needs at the time of the assessment (11/07). Sections of the stream near road crossings should be checked annually for aggradation and extensive emergent vegetation establishment which would reduce capacity and functionality of culverts. It should be noted that Reach 4 has a rather narrow cross-section, which could result in minor sediment aggradation causing extensive flooding of Guerneville Rd.

Steele Creek – Reach 2

JURISDICTION: Owned and maintained by SCWA

LOCATION: Ridley Ave to Marlow Rd.

ADJACENT LAND USE: Residential

UPSTREAM: Steele 3

LENGTH: 1,581 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 66 ft

AVERAGE TOP-OF-BANK WIDTH: 47 ft



(b) Reach 2 looking downstream at SCWA's recent bank stabilization project along channel bend. This project was completed during the summer of 2007 and photo is from November 2007. Note that bends can be particularly at risk for bank erosion in stream systems that have been straightened for most of their length due to greater velocities and shear along the outer bends.

MAINTENANCE HISTORY



(a) Reach 2 looking upstream to top of reach at Ridley Ave. crossing. Note dense growth of cattails at the mouth of the culverts (Nov. 2007).

PHYSICAL CONDITIONS

Reach setting: Reach 2 takes at 90° southward turn just downstream of Ridley Ave. and then continues directly west to Marlow Rd.

Active channel: 8-10 ft wide; inset 5-7 ft deep from top of bank; water depths range from 1-3 ft deep; flow is perennial.

Bed sediments/texture: generally finer textured sediments with high content of silts and muds.

Bank structure: linear trapezoidal channel with earthen banks throughout; banks range from 1:1 to 2:1 on south and nearly vertical in some locations on the north side.

Water quality: moderate turbidity; dominated by moving open water.

Channel processes: linear channel alignment with signs of geomorphic activity including bank erosion that resulted in recent 2007 bank stabilization efforts along bend (photo b); increasing size and frequency of in-channel or near-channel sediment bars/wedges along lower straightened section moving downstream (photo c).

Steele Creek – Reach 2

BIOLOGICAL CONDITIONS

Vegetation composition: Reach 2 is flanked by a narrow riparian corridor which supports extensive woody vegetation along the top of bank. These banks support a variety of different tree species including a planted line of live oaks and black oaks, liquid amber, eucalyptus, and fir. Understory is dominated by annual grasses, fennel, and other ruderal species on the south bank and ivy on the north bank (photos c and d).

Riparian corridor and canopy closure: There is a linear band of riparian woodland through much of Reach 2 with an average canopy cover of approximately 50% (range from 25-75%).

Instream habitat: The channel is straight and trapezoidal, but does contain a narrow well defined low flow channel. However, the channel appears to lack any significant complexity and is generally one long glide. There is little complexity, overhanging herbaceous vegetation (grasses, ivy, etc) do create some cover and facilitate creation of undercut banks (photo d).

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



(c) Mid Reach 2 in the middle of the long straight section. Notice the shading provided by the narrow riparian corridor, the well defined low flow channel, and all of the overhanging herbaceous vegetation (Nov. 2007).



(d) Reach 2, looking downstream 200 hundred feet upstream of Marlow Rd. Notice the sediment wedge/bar accumulating along the toe of the slope (grassy center of photo). This reach shows the first signs of significant sediment deposition within the Steele Cr. System (Nov. 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

There did not appear to be any pressing large scale management needs at the time of the assessment (11/07). The recent bank stabilization effort along the bend at the top of the reach should address the bank instability at that bend. If additional sediment begins to accumulate in this reach (i.e. growth of sediment wedges/bar), selective and localized sediment removal may become necessary to maintain flood capacity. Removal of cattails at the Ridley Crossing might be necessary in the future if the existing stand expands and reduces the capacity of the culvert.

Steele Creek – Reach 1

JURISDICTION: Owned and maintained by SCWA

LOCATION: ~750 ft upstream of Gamay St. (adjacent to eastern boundary of High School) to Piner Cr. confluence

ADJACENT LAND USE: Residential

UPSTREAM: Unmaintained channel

LENGTH: 1,931 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 62 ft

AVERAGE TOP-OF-BANK WIDTH: 57 ft



(b) Left: looking downstream toward upper Gamay St. crossing; and Right: looking upstream at downstream side of Gamay St. crossing. Large wedge of sediment covers the south cell at the upstream side of the crossing, and sediment deposit blocks all of the south cell and part of the north cell at the downstream side of the crossing (Nov. 2007).



(c) 50 ft upstream of Gamay St. At this point the channel transitions from being completely choked with cattails to open water. At the break, a pool has formed due to erosion of the far bank and is continuing to expand destabilizing the nearby bank (Nov. 2007).

MAINTENANCE HISTORY



(a) 75 ft upstream from Gamay St. crossing, looking upstream. Note lack of riparian canopy and that the trapezoidal channel bottom is completely choked with annual grasses (foreground) and cattails (background) (Nov. 2007).

PHYSICAL CONDITIONS

Reach setting: Upstream of this reach, Steele Cr. is not owned or maintained by SCWA for ~1000ft. Unlike Reach 2 and 3, the lower portion of Reach 1 still maintains some gentle sinuosity and the channel corridor widens with a remnant floodplain intact for ~500-750 ft downstream of Gamay St.

Active channel: 8-10 ft wide; inset 4-6 ft deep from top of bank; water depths range from 0.5 ft (diffuse flow and flow through narrow low flow channel) to 4 ft deep pool above Gamay; flow is perennial.

Bed sediments/texture: generally finer textured sediments with high content of silts and muds.

Channel processes: Channel is only wet during and after storm events when flows are high enough to divert into Spring Lake. Sediment settling area at weir facility accumulates sediment and emergent vegetation quickly establishes on the bars (photo b).

Bank structure: linear trapezoidal channel with earthen banks throughout most of the reach; some riprap sections near the Piner Cr. confluence; banks are steeper upstream of Gamay (1:1 – 1.5:1) and gentler downstream (2:1)

Water quality: moderate turbidity; dominated by moving open water.

Steele Creek – Reach 1

Channel processes: upstream of Gamay St. the channel is completely straight, trapezoidal, moderately incised, almost no gradient, and has no canopy and dense growth of grasses and cattails across the channel bottom; downstream of Gamay

St. the channel is modestly sinuous, flanked by a remnant floodplain (to the north), sustains a scattered riparian corridor, and appears to have an increasing gradient.

BIOLOGICAL CONDITIONS

Vegetation composition: Reach upstream of Gamay St. has a simple vegetation composition dominated by cattails and annual grasses in the channel and lawn grasses and scattered eucalyptus along the top of bank (photo a). Downstream the vegetation composition is more diverse with a remnant floodplain along the north bank for approximately 500 ft and narrow riparian corridor with woody vegetation developing as the channel flows toward Piner Cr. (photo d).

Riparian corridor and canopy closure: There is scattered riparian woodland along the lower portions of Reach 1. Average canopy cover in this area ranges from 0-25%.

Instream habitat: Upstream of Gamay St. aquatic habitat is limited to diffuse perennial flow through emergent vegetation. Just upstream of the crossing there is one moderate size pool. Downstream of Gamay the channel is more natural with some sinuosity, a narrow low flow channel, and connectivity to a small remnant floodplain. Generally the channel lacks complexity and the culverts at the Piner Cr. confluence are a complete barrier to fish.

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



(d) Looking upstream at Piner Cr. confluence. From Gamay St down to the confluence, a scattered canopy of woody riparian species has developed (Nov. 2007).



(e) Looking upstream from Channel Drive crossing. Banks are heavily vegetated (Nov. 2007).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Sediment management activities at the Gamay Street crossing are necessary at this time. At the upstream end of the crossing, one cell is nearly inoperable due to sediment accumulation. At the downstream end, a large sediment wedge appears to be blocking not only the southern cell, but part of the northern cell. In addition, vegetation management may need to be conducted in the upper portion of the reach to address any reduction in capacity resulting from extensive instream vegetation growth. Finally, SCWA should routinely assess the integrity of the culverts and the culvert apron at the Piner Cr confluence. Although they currently do not appear to be in need of urgent repair, some piping and underflow appears to be occurring. The section of Reach 1 upstream of Gamay could significantly benefit from additional canopy. As such, this reach would be a good candidate for planting of appropriate riparian canopy species.

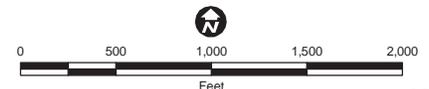


Vegetation Type

- 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 4-19
Reaches and Vegetation
Santa Rosa (10 of 13)



1 inch equals 1,000 feet

Santa Rosa Creek – Reach 6

JURISDICTION: SCWA owned and easement maintained

LOCATION: Santa Rosa Avenue to Hwy 101 crossing

ADJACENT LAND USE: Highway, commercial, residential

UPSTREAM: Matanzas and Spring Creeks

LENGTH: 1,402 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 122 ft

AVERAGE TOP-OF-BANK WIDTH: 80 ft



(b) Looking upstream to Santa Rosa Ave crossing from mid-reach. Note shading provided by tall redwoods and oaks on south bank (October 9, 2008).

MAINTENANCE HISTORY



(a) View downstream to pedestrian crossing from Santa Rosa Avenue. Note rip-rap and concrete-lined banks, weirs, and minimal vegetation (October 9, 2008).

PHYSICAL CONDITIONS

Reach setting: Located in the middle of the watershed, this is the reach where the headwater creeks merge to form the mainstream channel that flows to the Laguna. Located at the toe of the alluvial fan in the transition to alluvial plain. Also located at the upper end of restoration project to stabilize banks and improve recreational access along the channel.

Active channel: width varies between 10 and 20 ft with low flow channel depths ranging 6-12 inches.

Bed sediments/texture: coarser sediments, sands and cobbles.

Bank structure: generally rip-rapped and steep (1:1 and vertical in places). Bank height is approximately 20ft (photo d).

Water quality: clear flowing water observed on 10/8/08.

Channel processes: small weirs, riffles and pools designed as part of restoration project (photo a) help to slow water and encourage settling of fine silts and sands from the water column.

Santa Rosa Creek – Reach 6

BIOLOGICAL CONDITIONS

Vegetation composition: willow scrub and riparian species grow densely along banks in the lower portion of the reach (photos c and d), gradually decreasing upstream where rip rap fully lines both banks (photos a and b).

Riparian corridor and canopy closure: 0-5% canopy closure mostly from willow scrub vegetation downstream and trees located above the top of bank (photo b).

Instream habitat: low quality habitat due to lack of developed riparian corridor. Reach is maintained for flood control, but provides an important migratory corridor for fish passing from the Laguna to spawning grounds in the upper Santa Rosa Creek watershed. Pools and riffles provide instream habitat for a variety of aquatic species.

Listed species with potential to occur: Steelhead trout and Chinook salmon migration, western pond turtle, listed plants in non-grouted areas.



(c) Looking upstream from A Street crossing; note clear active channel (October 9, 2008).



(d) Dense willow scrub along banks looking downstream from A Street towards Hwy 101 crossing (October 9, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Consider limbing willows along channels, as opposed to removing them entirely. This will encourage shading over the channel.

Santa Rosa Creek – Reach 5

JURISDICTION: SCWA owned and easement maintained
LOCATION: Hwy 101 to West 3rd Street
ADJACENT LAND USE: Residential and commercial
UPSTREAM: Santa Rosa Reach 6
LENGTH: 1,402 ft
CHANNEL EASEMENT CORRIDOR WIDTH: 110 ft
AVERAGE TOP-OF-BANK WIDTH: 67 ft



(b) Looking upstream from Railroad Street crossing. Note dense riparian vegetation on both banks (October 9, 2008).

MAINTENANCE HISTORY



(a) Looking upstream from a pedestrian crossing west of Highway 101 (October 9, 2008).

PHYSICAL CONDITIONS

Reach setting: Located at the toe of the alluvial fan from the Mayacamas Mountains. Sediment transport reach. Additional surface runoff conveyed to channel from surrounding development. Channel has been modified to provide flood control for the downtown area and recreational access. Perennial flows.

Active channel: The entire channel bed in the upper half of the reach (20 ft wide) is active, while a 5-8 ft wide low flow channel has been installed at the lower half of the reach. Water was observed at a 6-12 inch depth on 10/9/08.

Bed sediments/texture: coarse sediments and cobbles noted upstream of Railroad Street. Fully grouted channel bed and banks downstream of Railroad Street.

Bank structure: Earthen and rip-rapped banks upstream of Railroad Street. Fully grouted bank downstream of Railroad Street. Banks are steep (2:1) and range from 15 to 60 ft in height.

Water quality: clear, flowing water observed on 10/8/08. Patches of algae growth noted (Photo b).

Channel processes: Sediment transport reach. Reach maintained to provide flood control. Reach forms a bend in the overall channel, thus banks have been stabilized to prevent erosion.

Santa Rosa Creek – Reach 5

BIOLOGICAL CONDITIONS

Vegetation composition: Willow scrub and riparian species gradually decrease in density along banks moving downstream. Growth is limited in lower portion of reach due to bank and channel lining. Approximately 25% of the in-channel area is covered by mixed riparian wetland species at the water's edge.

Riparian corridor and canopy closure: Willow, redwood, and oak trees along bank provide up to 40% canopy cover over the channel throughout the reach (photos a and c).

Instream habitat: riparian vegetation provides shade and nutrients for aquatic species. However, grouted banks void of vegetation allow growth of emergent vegetation, such as algae, to degrade habitat quality. Grouted channel bed provides lower quality habitat for aquatic species.

Listed species with potential to occur: migratory and rearing habitat for steelhead and Chinook. Western pond turtle habitat present. Special status plants.



(c) Looking downstream to West Third Street crossing from railroad tracks. Note upper bench on right bank (October 9, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Reduce portions of channel covered by grout and rip-rap. Increase canopy cover. Vegetation thinning where appropriate for flood control.

Santa Rosa Creek – Reach 4

JURISDICTION: SCWA owned and easement maintained

LOCATION: West 3rd Street to Stony Point Road

ADJACENT LAND USE: Residential, open/vacant land, public trail

UPSTREAM: Santa Rosa Reach 5

LENGTH: 8,750 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 141 ft

AVERAGE TOP-OF-BANK WIDTH: 94 ft



(b) Looking upstream at the middle of the reach. Note larger cobbles and bed sediments (October 9, 2008).

MAINTENANCE HISTORY



(a) Bank and channel bed is rip-rapped and grouted at the Pierson Street crossing, looking upstream. Flows are contained along the inner area around the bend, on the right (October 9, 2008).

PHYSICAL CONDITIONS

Reach setting: The creek transitions to a gentler gradient, depositional creek in this reach. The channel meanders from east to west with hardened banks around outer bends to protect against erosion. A wide, paved public path is located on the top of both banks.

Active channel: the active channel is wide (15-30 ft) and supports shallow riffles and glides. No low flow channel or in stream benches are present.

Bed sediments/texture: Fully grouted and rip-rapped bed and banks at the Pierson Street crossing (photo a), transitioning to large cobbles near the Dutton Avenue crossing (photo b). Coarser gravels and sands occupy the bed at the lower end of the reach.

Bank structure: Upstream of Pierson Street where the creek bends to the south, the banks are grouted and rip-rapped (photo a). Banks downstream from Pierson Street are earthen and steep (<2:1), and are approximately 30 ft high from the bottom of the channel (photos a and d).

Channel processes: Hardened bed and banks around meander bends prevent scour and therefore reduce sediment inputs. Some gravel bars have formed in the lower half of the reach (photo c), but no significant accumulation of sediment.

Santa Rosa Creek – Reach 4

Water quality: Water depth of approx 2 ft was observed on 10/9/08, with good flow and no visible water quality degradation (photos b and d).

BIOLOGICAL CONDITIONS

Vegetation composition: Willow scrub and riparian species dominate bank vegetation.

Riparian corridor and canopy closure: Tree species including California bay laurel, oak, willow, and ash provide canopy cover between 40-50% (photos b and d), with full canopy cover in some places (photo c). As the bank becomes grouted upstream, canopy closure significantly decreases (photo a).

Instream habitat: low quality habitat upstream of Pierson Road, gradually improving moving downstream. Wide shallow flat channel bed lacks diversity of in-channel features preferred by aquatic species.

Listed species with potential to occur: Steelhead and Chinook migratory and rearing habitat, western pond turtle habitat.



(c) Looking upstream from Dutton Road; note full canopy and dense bank vegetation (October 9, 2008).



(d) View upstream from Stony Point Road shows limited in-channel vegetation and moderate canopy cover (October 9, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Santa Rosa Creek Reach 4 are focused on vegetation management. Limb riparian trees and trim vegetation as necessary to maintain flood carrying capacity. Encourage growth of riparian overstory to reduce growth of algae mats.



Vegetation Type

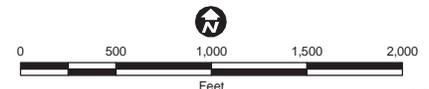
- █ Blackberry Scrub
- █ Mixed Riparian Scrub
- █ Riparian Woodland (full canopy)
- █ Riparian Woodland (up to 75% canopy)
- █ Riparian Woodland (up to 25% canopy)

- █ Riparian Forest
- █ Ruderal
- █ Willow Scrub
- Developed

—|—| SMP Maintenance Reaches

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

FIGURE 4-20
Reaches and Vegetation
Santa Rosa (11 of 13)



1 inch equals 1,000 feet

Santa Rosa Creek – Reaches 3 & 2

JURISDICTION: Owned in-fee by SCWA

LOCATION: Santa Rosa 3: Marlow Road to Fulton Road
Santa Rosa 2: Fulton Road to Willowside

ADJACENT LAND USE: Mix of Residential and Park/Percolation Ponds

UPSTREAM: Santa Rosa Creek Reach 4

LENGTH: Santa Rosa 3: 8,750 ft.
Santa Rosa 2: 11,081 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:

Santa Rosa 3: 141 ft.
Santa Rosa 2: 223 ft.

AVERAGE TOP-OF-BANK WIDTH:

Santa Rosa 3: 94 ft.
Santa Rosa 2: 158 ft.



(a) Reach 3, looking downstream from just below the Marlow Road Bridge. Note the rip rap and swiftly flowing water observed in September 2008. Sediment deposition appears to be limited to small margin bars (both banks), and a moderate channel gradient leading to an open uniform channel geometry (9/29/08).



(b) Reach 3, looking across the channel upstream from College Creek confluence. Notice how the dense riparian vegetation along the banks in photo (a) has been replaced by ruderal grassland type vegetation and the presence of a d-bar constricting flow to a small 2-3 wide vegetated channel with large open channel segments both upstream and downstream (9/29/08).

MAINTENANCE HISTORY

PHYSICAL CONDITIONS

Reach setting: Reaches 3 and 2 are located just west of downtown Santa Rosa, flow in a westerly direction, and mark the transition between the higher gradient urban upstream reaches and the lower gradient/lagoon agricultural reaches. These reaches are highly modified, straightened, flow between high, steep banks (photo b) and drain a number of tribs from the north including College, Piner, Peterson, and Abramson Creeks.

Active channel: Open water areas range between ~14 and 25 ft wide (photos a and d) with confined low flow channels 4 to 8 ft wide (photos b and c); depths range from 6 in. to 3 ft.

Bed sediments/texture: dominated by a mix of gravel, sand, and silt with extensive gravel and sand bars forming throughout.

Bank structure: slopes are generally between 2:1 and 1:1 with soil over rip-rap (photo b).

Channel processes: The major forces at play in these reaches are natural channel restoration and the increasing influence of lagoonal forces. In Reach 3, the bars and wedges are smaller and flow is generally more uniform, whereas in Reach 2, where gradient decreases and backwater effects begin to play out, bars become the dominate in-channel feature with

Santa Rosa Creek – Reaches 3 & 2

large heavily vegetated bars on alternating banks (photos c and d). Limited instream management in concert with canopy enhancement efforts, has allowed the channel to begin “re-naturalizing” within the larger engineered x-section.

Water quality (qualitative): worsening downstream with significant stagnation observed in August 2008 in lower Reach 2.

BIOLOGICAL CONDITIONS

Instream Habitat: Aquatic habitat in these reaches increases in quality and quantity moving downstream. Whereas upper Reach 3 contains limited complexity with a shallow uniform trapezoidal geometry (photo a and b), by mid-Reach 2 the channel contains a mix of bars, pools, riffles, undercut banks, hanging vegetation, etc., leading to improved aquatic habitat conditions (photos c and d).

Vegetation composition: Woody riparian vegetation is intermittent in Reach 3 with many areas of sparse growth (photo b) and some areas of moderate growth (photo a). In Reach 2, most of the banks are covered in dense shrub or woody riparian species including willows and alders along the toe of slope and a mix of oaks, maples, and weeping willows on the banks (photo d). Bank understory or non-woody vegetation includes annual grasses, blackberry, and a mix of ruderal species. Bars and wedges are heavily vegetated with cattails, sweet clover, and arroyo willow.

Riparian corridor and canopy closure: 15-40 ft. wide with an assortment of low floodplains and higher terraces; canopy is generally denser on southern banks and ranges from 0-25% closure in many locations to segments with full canopy (i.e. >75%).

Listed species with potential to occur: Reach 2 has a moderate to high likelihood of California tiger salamander in the potential upland habitat, they are unlikely to occur in reach 3; Both reaches have known steelhead occurrence (reaches are migration corridor with potential rearing habitat); Coastal Chinook observed in both reaches (reaches are migration corridor with potential spawning and rearing habitat; potential habitat for western pond turtle and listed plant species.



(c) Reach 2, about 500 ft downstream of Fulton Road Bridge, looking across the channel from a large vegetated bar to another large bar just downstream. At this location, the low flow channel has gone from being about 25 ft wide to about 8 ft wide due to confinement between alternating d-bars (8/21/08).



(d) Lower Reach 2, looking downstream from just upstream of the Abramson Cr confluence. Notice the large stand of cattails in the background and the stagnant “pool” in the foreground. Beyond the photo the cattail bar reduced the low flow channel from ~ 20 ft wide to ~6 ft wide creating a significant flow impediment and creating the stagnant conditions upstream. This photo is typical of the pool and wedge/bar geometry common to Reach 2 (8/21/08).

Santa Rosa Creek – Reaches 3 & 2

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Reach 3 are currently limited to vegetation management along the toe of slope to reduce dense arroyo willow growth and to enhance other riparian canopy species. Small bars forming in Reach 3 should be watched for impacts to conveyance and/or capacity, but current conditions do not appear to warrant major in-channel maintenance. Reach 2, on the other hand, appears to be heavily impacted by the presence of large bars/wedges increasing in size and frequency moving downstream. These bars are large enough to support robust populations of arroyo willows and create the potential for significant flood control issues. One example is the large set of bars within a ~200 ft segment of stream upstream of the Willowside Road Bridge. Willows were removed from this bar in 2005 and by August 2008, the bar was covered completely obscured by a dense thicket of 20-30 ft tall willows. The key for successful management of these bars will be determining how much material and vegetation needs to be removed to provide safe flood conveyance while encouraging the passive restoration or re-naturalization of the aquatic environment. Finally, since any sediment mobilized from these bars will eventually be re-deposited in the Laguna de Santa Rosa, particular attention needs to be paid to managing sediment in these reaches to reduce future sediment deposition into the Laguna.

College Creek – Reaches 3 & 2

JURISDICTION: Owned and maintained by SCWA

LOCATION: College 3: ~250 ft downstream from Ridley Ave. to Marlow Dr.
College 2: Marlow Dr. to West College Dr.

ADJACENT LAND USE: Residential

UPSTREAM: Piped stormdrain system

LENGTH: College 3: 1,302 ft.
College 2: 542 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:

College 3: 87 ft.

College 2: 67 ft.

AVERAGE TOP-OF-BANK WIDTH: College 3: 57 ft.

College 2: 43 ft.



(b) Lower Reach 3 looking downstream. Steep and near vertical banks result in bank sloughing. During the assessment conducted in November of 2007, there were at least 2 other areas of similar bank instability (May 6, 2008).

MAINTENANCE HISTORY



(a) Middle of Reach 3 looking downstream. Sediment wedges and bars develop along toe-of-banks; channel has gentle sinuosity and dense bank vegetation (May 6, 2008).

PHYSICAL CONDITIONS

Reach setting: College Creek is a small local tributary to Santa Rosa Creek with a small catchment size; upstream of Reach 3 flows collect in a stormwater drain system with no open channel; channel slope is gentle throughout.

Active channel: 8-10 ft wide and 8-12 ft depth from top of bank at upper end of Reach 3 (photo b) and 2-4 ft depth at lower end of Reach 3 and Reach 2 (photos c/d); water depths range from 0.5-1.5 ft; flow is perennial.

Bed sediments/texture: coarse sands and gravel dominate the bed in much of Reach 3 and Reach 2; at lower end of Reach 3 some fine sands upstream of crossing.

Bank structure: engineered trapezoidal channel with earthen banks throughout most of the reach; bed and banks are hardened at road crossings; banks are steeper upstream (photo b), and become gentler downstream (photo d).

Water quality: generally running clear; dominated by moving open water.

Channel processes: downstream of Ridley Ave., the channel alternates between newly developing sediment bars (photo a) and incised areas with bank erosion (photo b); gradient lessens downstream thru Reach 2; hydraulic

College Creek – Reaches 3 & 2

constriction at West College Dr. creates depositional environmental (photo d).

BIOLOGICAL CONDITIONS

Vegetation composition: Reach 3 contains a dense and diverse canopy and understory along the channel. The understory is dominated by a mix of annual grasses and non-native herbeaceous species. Woody species in Reach 3 include a broad array of ornamental species including privet, acacia, cotoneaster, and eucalyptus with some native species such as oaks and/or redwoods (photo a). Vegetation composition changes dramatically in Reach 2 with almost no understory present and a continuous line of native and non-native trees species. Neither reach contains significant emergent vegetation in the channel.

Riparian corridor and canopy closure: Canopy closure increases moving downstream from Reach 3 to Reach 2; average canopy closure is around 25% in Reach 3 and 50% in Reach 2.

Instream habitat: Reach 3 exhibits a moderate degree of channel complexity with local bar/pool sequences, undercut banks, and submerged root masses. In general, Reach 3 is mainly glide habitat and Reach 2 is an even more uniform glide/run for its entire length.

Wildlife and listed Species: both reaches are potential habitat for western pond turtle.



(c) Middle of Reach 2, just downstream of Marlow Dr. crossing, looking downstream through straightened section. Notice the dense riparian canopy covering the channel and the lack of emergent vegetation in the active channel (May 6, 2008).



(d) Bottom of Reach 2 looking downstream at West College crossing. A large (15 ft and 100 ft long) wedge of sediment has accumulated upstream of this crossing. 2 of the 3 cells are dramatically reduced in capacity (May 6, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

At the time of channel assessment, the most pressing consideration is the need for sediment removal at the W. College Dr. crossing where accumulated sediment and debris is severely blocking the culverts (photo d). Additionally, several smaller local culvert outfalls that drain to College Cr. are blocked due to sediment accumulation in the College Cr. channel. These outfalls should be inspected for their operation. Three to four sites along upper Reach 3 with steep banks show erosion and may require future stabilization. These sites should also be monitored. Reach 3 includes several bars which may be aggrading and should also be monitored. No evidence of overbank flows or imminent flood hazards associated with these instream bars in upper Reach 3 were observed. When and if either the instream bars or the sloughing banks are addressed, additional canopy plantings could benefit the existing riparian habitat along Reach 3.

College Creek – Reach 1

JURISDICTION: Owned by SCWA, eastern margin owned by City of Santa Rosa

LOCATION: West College Ave. to confluence with Santa Rosa Creek

ADJACENT LAND USE: SCWA maintenance yard and open space on north/west side; wastewater ponds on south/east side

UPSTREAM: College Creek Reach 2

LENGTH: 2,675 ft

CHANNEL EASEMENT CORRIDOR WIDTH: 73 ft

AVERAGE TOP-OF-BANK WIDTH: 52 ft



(b) Mid Reach 1 looking downstream; cobbles and small boulders from bank protection on right are sloughing down into channel, note small instream rock drop structure in mid-distance, and emergent vegetation above sediment and rocks collecting in far distance in channel, access road provides recreation path to right (May 6, 2008).

MAINTENANCE HISTORY



(a) Upper Reach 1 looking downstream from College Ave.; rip-rapped banks downstream of crossing, note sediment wedge developing on inner bank (right) with emergent vegetation, and next downstream bar on opposite bank providing some channel sinuosity; reach includes canopy of mature trees including oaks (May 6, 2008).

PHYSICAL CONDITIONS

Reach setting: Reach 1 is the downstream portion of College Creek prior to its confluence with Santa Rosa Creek. The reach is uniform with a linear and narrow low-flow channel. Some sediment deposition was observed to the south of the West College Avenue overcrossing at the upstream end of the reach. Slope is gentle, with key gradient change occurring at culvert outfalls that join Santa Rosa Creek, through a 10 ft. drop in elevation at the south end of reach.

Active channel: 4-12 ft wide, ½ -2 ft deep

Bed sediments/texture: mostly sand, some gravels, and some cobbles where sloughed from banks.

Bank structure: trapezoidal engineered channel with gently sloped banks (2:1 or less); rip-rapped banks along much of reach; some undercut banks.

Water quality (qualitative): no problems observed, although land uses in watershed could contribute contaminants typical of urban runoff.

Channel processes: With the exception of the upstream end, where sediments collect at the College Ave. culvert, the reach has no excessive channel aggradation or incision. The

College Creek – Reach 1

downstream end of the reach is hardened at the culverted confluence with Santa Rosa Creek.

BIOLOGICAL CONDITIONS

Vegetation composition: riparian woodland is limited along both banks. Understory is dominated by large areas of Himalayan blackberry, non-native grasses, and other ruderal species. In-channel vegetation is minimal.

Riparian corridor and canopy closure: Riparian woodland has approximately 25% canopy closure across the creek; the riparian corridor consists of a mix of native and non-native species such as redwood, oak, pine, buckeye and eucalyptus.

Instream habitat: The reach has an established low-flow channel, with some channel sinuosity in portions. There are few riffle-pool sequences, and undercut banks with overhanging vegetation provide some instream complexity. However, channel complexity is generally low and the lack of riparian canopy closure limits this reach's quality as aquatic habitat.

Wildlife habitat and listed species: potential habitat for western pond turtle.



(c) Lower Reach 1 (near Santa Rosa Creek confluence) looking upstream, very linear channel, 10 ft. wide below steep banks (1:1) (May 6, 2008).



(d) Lower Reach 1 looking downstream to Santa Rosa Creek confluence, note abundant blackberry on left bank, Eucalyptus trees in distance mark Santa Rosa Creek (May 6, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Channel maintenance activities at College Creek Reach 1 focus on sediment and debris removal downstream of the College Ave. culverts, where materials are deposited and accumulate. The remainder of the reach showed no urgent maintenance needs. Opportunities to remove blackberry and Eucalyptus near the Santa Rosa Creek confluence in favor of more suitable native riparian species should be evaluated periodically. The adjacent waste water treatment ponds may provide longer term opportunities for multi-objective uses.

Piner Creek – Reaches 2 & 1

JURISDICTION: Owned in-fee by SCWA

LOCATION: Reach 2: Guerneville Rd. to Fulton Rd.
Reach 1: Fulton Rd. to Santa Rosa Cr

ADJACENT LAND USE: Residential, with Agriculture on the last 500 ft on Reach 1

UPSTREAM: Piner Creek Reach 3

LENGTH: Piner 2: 3,270 ft.
Piner 1: 2,454 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Piner 2: 111 ft.
Piner 1: 117 ft.

AVERAGE TOP-OF-BANK WIDTH: Piner 2: 72 ft.
Piner 1: 69 ft.



(b) Mid Reach 2, looking across the channel at a large sediment wedge (left) and a pool/run (right). This photo is representative of the sediment wedge-pool morphology common in SCWA's low gradient, engineered flood control channels (August 2008).



(a) Mid Reach 2, looking upstream from a sediment deposit spanning the channel and creating stagnant water conditions. Dense growth of green and brown algae (August 2008).

PHYSICAL CONDITIONS

Reach setting: Reaches 2 and 1 traverse a low gradient area of the Santa Rosa Plain and represent a major shift in channel geometry. Upstream reaches were wide with steep but low banks (4-8 ft high), the geometry in Reaches 2 and 1 changes to a narrow channel bed with steep and higher banks (14-16 ft).

Active channel: 4-6 ft wide through both reaches with flow depths ranging from 2-24 in. (photos a and b).

Bed sediments/texture: coarser than upstream reaches, dominated by mix of sand and gravels.

Bank structure: earthen banks are generally sloped at 1:1; banks are often faced with rip-rap (photo c)

Channel processes: Reaches 2 and 1 differ from upstream Piner Cr. reaches in many ways. Channel is narrower and deeper and the sediment textures become coarser downstream with more sand/gravel. Lower Piner reaches include several depositional features (d-bars, margin bars, and large wedges are common) than the reaches immediately upstream

Water quality (qualitative): poor, open water is turbid with high levels of stagnation and algae growth in August of 2008 (photos a and b).

Piner Creek – Reaches 2 & 1

BIOLOGICAL CONDITIONS

Instream Habitat: habitat conditions in Reaches 2 and 1 are similar and include the alternating sediment wedge-pool morphology. Open water areas still lack habitat complexity, but increased canopy along the toe of slope and low banks and a narrower active channel provide more shaded aquatic habitat. Also, areas of open water are longer and larger and contain small gravel and sand bars, providing for some instream complexity.

Vegetation composition: the narrow riparian corridor contains a mix of shrubs and trees dominated by coast live oaks with occasional arroyo willows and alders near the toe of slope or in the channel. Understory is dominated by fennel, blackberry, teasel, and grasses with cattails, tules and annual grasses dominating the in-channel habitats.

Riparian corridor and canopy closure: 15-20 ft. wide corridor on each bank, narrower than immediately upstream reaches, with canopy becoming sparser in Reach 1. Canopy is as high as 50% in portions of Reach 2 and as little as 0% in much of Reach 1.

Listed species with potential to occur: potential habitat for western pond turtle which have occurred in these reaches, salmonids are known to migrate through these reaches to known rearing habitat in Reach 3 and Paulin Creek. Low likelihood of occurrence of California tiger salamander in Reach 1 (unknown status in Reach 2).



(c) Reach 1 looking across the channel at a slumping bank that slid into the channel creating a 2 ft high bar at the toe of the bank. Exposed rip-rap is seen at the toe just upstream of the slip, this base of bank rip-rap extends throughout both reaches (August 2008).



(d) Bottom of Reach 1, looking downstream to confluence with Santa Rosa Cr.; channel gradient steepens at confluence; channel is covered with a dense growth of tules from the pedestrian bridge to the confluence (August 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Piner Creek Reaches 2 and 1 include focused sediment removal at some key bars and blockages, vegetation thinning in locations, and opportunities to enhance habitats. Steelhead are known to rear in upstream Reach 3 and in nearby Paulin Creek (also upstream). The following actions may improve steelhead habitat: clearing the vegetation at the confluence of Piner and Santa Rosa Cr, cutting low flow channels through some of the large sediment wedges in Reaches 2/1, increasing instream habitat complexity and pool formation, and increasing canopy closure along Reach 1. These actions would benefit a wide array of aquatic and riparian species, including steelhead.

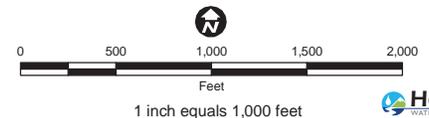


Vegetation Type

- 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 4-21
Reaches and Vegetation
Santa Rosa (12 of 13)



Peterson Creek – Reach 2

JURISDICTION: Owned in-fee by SCWA
LOCATION: Youth Community Park to Guerneville Rd.
ADJACENT LAND USE: Rangeland/Ag and low density residential (in lower portion of reach)
UPSTREAM: Non-SCWA Maintained Reach
LENGTH: 3,652 ft
CHANNEL EASEMENT CORRIDOR WIDTH: 62 ft
AVERAGE TOP-OF-BANK WIDTH: 43 ft



(b) Mid-Reach 2 looking upstream at bend. Heavily vegetated channel upstream (tules) transitions to a moist (but not flowing) and relatively un-vegetated streambed in the foreground. Also note the outside of the bend is eroded, creating a 1-2ft high gravel bar at base of bank (Sept. 2008).

MAINTENANCE HISTORY



(a) Upper end of Reach 2, looking downstream. Engineered and straightened channel cross section is immersed in cattails across the bed, blackberry along the lower banks, and oaks higher at the top-of-bank (Sept. 2008).

PHYSICAL CONDITIONS

Reach setting: This reach flows through expansive grassland/pasture in the central/western Santa Rosa Plain, west of the urbanized area of Santa Rosa. Upstream of Reach 2, the channel flows ~1500' through the Youth Community Park and then appears to go underground and is fed by storm drains emanating from western Santa Rosa. The upper 2/3 of the Reach are straight and the lower 1/3 has some limited sinuosity.

Active channel: 6-8 ft wide with a narrow 1-2 ft wide low-flow channel (photos a/b); water depths ranged from dry to small pockets of water ~1-4 in. deep (September 2008).

Bed sediments/texture: range of conditions with cobbles and gravels (photo d), other areas dominated by silts and clay (photo a).

Bank structure: slopes are generally steep between 1:1 and 2:1; banks are mostly earthen, with rock at bends in lower portion of the Reach; several bank areas are eroding along toes.

Channel processes: the straightened upper portion of the Reach appears to be conveying runoff from upstream residential communities as well as numerous storm drain outfalls throughout the reach; deposition is limited to a long narrow margin bar along the northwest bank. In the lower portion of the reach, significant bank erosion was observed in multiple locations;

Peterson Creek – Reach 2

downstream of these locations gravel bars are forming (from eroded bank material) resulting in bar/pool sequences (with riffles when wetted). Although the upper portion of this reach had two small pools and there were 2 larger pools observed in the lower reach, the reach was mostly dry in September 2008 (photos c and d).

Water quality (qualitative): generally clear with some turbidity in the few pools observed in September 2008.

BIOLOGICAL CONDITIONS

Instream Habitat: Aquatic habitat in this reach is limited in the dry season by a lack of water throughout most of the reach. Two small and two medium sized pools were observed in the reach in September 2008. Traveling downstream, instream complexity appears to increase with the formation of low gravel bars (riffles when wetted), scattered pools, and undercut banks toward downstream.

Vegetation composition: Upper Reach 2 supports a sparse woody canopy with young live oak and valley oaks along the top of the bank with occasional willows at the toe of the slope (photos a/b). In most places banks are covered with dense thickets of blackberry. In addition to the dominant blackberry, annual grasses, teasel, fennel, and doc occur on the banks. The stream bed is often bare with a number of large stands of cattails and/or tules (photos a/b).

Riparian corridor and canopy closure: 10-20ft. wide corridor on each bank with very limited canopy closure ranging from 0% (dominant case) to 25% (Upper Reach 2).

Listed species with potential to occur: potential habitat for western pond turtle, California tiger salamander, and special status plants.



(c) Mid-Reach 2 looking downstream. Very extended pool of open water supports *Ludwigia*. Steep bank to left covered in blackberry. The bank to the right has sloughed/slumped forming a 1-2 ft high bar at the base of the right bank (Sept. 2008).



(d) Lower Reach 2 looking downstream near Guerneville Rd. Note gravel bar and pool sequence which is typical to Reach 2. Also notice that the left bank is undercut and appears to be contributing sediment to the gravel bar. This situation was observed in several locations along the reach (Sept. 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

In the short-term, the upper portion of this reach would benefit from in-channel vegetation thinning, while the lower reach should be watched for issues associated with bank instability. The reach contains two agricultural crossings, both of which appear to be outdated and could potentially fail in high flows. In the longer-term, these crossings should be assessed for potential repair or replacement. The northwest bank

Peterson Creek – Reach 2

between the uppermost bend and second bend shows erosion and instability (photo b). This erosion appears to be responsible for the gravel recruitment and development of bars downstream. Erosion was also observed just upstream of the Guerneville Rd. crossing. At the transition between the earth/rock bank and the grouted rock bank, the bank has eroded leading to flows moving under and behind the grouted bank protection. In terms of tree cover, although there appears to be significant recruitment of young oaks in the upper portions of this reach, the canopy is still very sparse and the entire reach could benefit from canopy enhancement activities.

Peterson Creek – Reach 1

JURISDICTION: Owned in-fee by SCWA
LOCATION: Guerneville Rd. to Santa Rosa Cr. Confluence
ADJACENT LAND USE: Agricultural/vineyard
UPSTREAM: Peterson Reach 2
LENGTH: 2,697 ft
CHANNEL EASEMENT CORRIDOR WIDTH: 89 ft
AVERAGE TOP-OF-BANK WIDTH: 56 ft



(b) One of many large in-channel bars observed in this reach. These wedges are scattered throughout the reach and are between 50-150 ft long and between 1-3 ft high. While the scoured channels between these wedges appear to be coated in a fine white silt with limited vegetation growth (photo a), these bars are composed of sand and silt and support dense, lush growth (Sept. 2008).

MAINTENANCE HISTORY



(a) Looking downstream from upper Peterson Reach 1. The active channel is wide, scoured, and void of vegetation. The low-flow channel is moist although there is no surface flow. Note in the background, a large cattail vegetated sediment wedge which crosses the entire channel (Sept. 2008).

PHYSICAL CONDITIONS

Reach setting: Reach 1 connects the Peterson/Forestville tributaries to Santa Rosa Creek. Whereas in-channel sediment deposition was limited in upstream reaches, Reach 1 has several large instream wedges/bars (photos a and b). Significant erosion in upstream reaches, as well as, localized scour are likely contributing to the development of these bars.

Active channel: 6-10 ft wide, widths generally increasing downstream; no surface flow was observed in September 2008.

Bed sediments/texture: some gravels in the upper sections, fining to bed and bars dominated by sands, silts and clay with a thin layer of silty-clay along the channel bottom in most places.

Bank structure: slopes are generally steep (photo a) 1:1 or steeper with earthen and rip-rap sections.

Channel processes: The noteworthy stream form of Reach 1 is the extensive sediment wedge, followed by pool sequence through the reach. Numerous large (1-3 ft high and 50-150 ft long) sediment deposits span the channel. In “pool” areas, the banks are undercut in many locations adding to the sediment load and destabilizing banks. It should be noted that in scour areas soft sands and silts appear to be

Peterson Creek – Reach 1

moist, but no surface flow was detected; this residual moisture could indicate near surface flow and/or could be resulting from ground water fluctuations caused by evapotranspiration or groundwater pumping at adjacent vineyards.

Water quality (qualitative): dry in September 2008 with many areas of moist substrate.

BIOLOGICAL CONDITIONS

Instream Habitat: Aquatic habitat in this reach is limited in the dry season by a lack of water. No surface water was observed in September 2008. Although the channel is completely straight, some in-channel complexity has developed due to the significant deposition and undercut banks. In general, habitat in this reach is of low quality for aquatic critters due to dry and scoured runs/pools and dry, heavily vegetated wedges.

Vegetation composition: Reach 1 supports a variety of in-channel vegetation types including tules, cattails, willows, as well as an array of grasses and forbs (photos b and c). Woody vegetation is limited to a few willow stands and scattered live oaks along the upper banks. Where the oaks are present, understory is dominated by duff and dry annual grasses (photos a/b). Where oaks are absent (including the in-channel bars/wedges), vegetation is dominated by blackberry, annual grasses, tease and fennel.

Riparian corridor and canopy closure: 10-30 ft. wide corridor on each bank with very sporadic canopy closure ranging from <10% (dominant case) to 25-50% (photo c).

Listed species with potential to occur: potential habitat for western pond turtle and California tiger salamander; California Coastal Chinook are known to occur in Santa Rosa Creek downstream.



(c) Mid Reach 1 looking upstream at a large bar covered in tules. Bars in this reach support a wide variety of emergent vegetation including tules and cattails as well as willows and annual grasses. Also note that like photo a, the channel appears to be moist in certain locations (Sept. 2008).



(d) Looking downstream from Peterson 1 to Santa Rosa Cr. Reach 2. There is no discernible low flow channel connecting this reach with Santa Rosa Cr.; instead flows from Peterson sheet over the grouted rock into Santa Rosa Cr. This confluence likely prevents the movement of anadromous fish into Peterson Creek (Sept. 2008).

Peterson Creek – Reach 1

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Peterson Creek Reach 1 should focus on sediment management. Although it is not clear whether the current accumulation of sediment has reduced conveyance capacity to a level which warrants a reach-scale sediment removal project, the existing bars will likely need to be skimmed or removed in the future. Moreover, removing sediment from Peterson Creek will guarantee that these sediments are not mobilized in the future and deposited in Santa Rosa Cr. and the Laguna de Santa Rosa downstream. There were also a number of areas of bank undercutting noted along this reach (in areas between the sediment wedges) that should be watched for future effects on bank stability. Finally, although the live oak canopy appears to be expanding additional effort to enhance canopy along this reach could benefit a number of riparian species.

Forestview Creek – Reaches 3, 2 & 1

JURISDICTION: Owned in-fee by SCWA

LOCATION: Reach 3: Fulton Rd to Country Manor. Reach 2: Country Manor Dr. to Guerneville Rd. Reach 1: Guerneville Rd. to Peterson Creek Confluence

ADJACENT LAND USE: Low density residential and agriculture

UPSTREAM: Buried culvert

LENGTH: Forestview 3: 1,047 ft.
Forestview 2: 2,133 ft.
Forestview 1: 478 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Forestview 3: 54 ft.
Forestview 2: 55 ft.
Forestview 1: 60 ft.

AVERAGE TOP-OF-BANK WIDTH: Forestview 3: 41 ft.
Forestview 2: 43 ft.
Forestview 1: 41 ft.



(b) Lower Reach 3, looking upstream. Dense line of cattails fills the channel bottom, clearly demarcating the active channel. This area was completely dry in August 2008.

MAINTENANCE HISTORY



(a) Upper Reach 3, one of two small pools in the upper reach. About 100 ft downstream from this pool the channel was dry in August of 2008. Note the heavy growth of blackberry around this pool and the stagnant look of the water.

PHYSICAL CONDITIONS

Reach setting: These reaches are engineered, very uniform, and straightened in most places. Forestview Cr. is a small tributary draining the Santa Rosa Plain west of Santa Rosa; watershed lands upstream include residential neighborhoods which drain through a series of stormdrains and culverts. Only uppermost portion of Reach 3 supported surface flow in August of 2008.

Active channel: 6-8 ft wide through all reaches with water depths to 12 in. in upper pools (photo a), but no surface flow elsewhere downstream (photo d).

Bed sediments/texture: dominated by silt and clay with a thin layer of cracked clay along the channel bottom in most places, desiccation indicating recent wetting and drying cycles.

Bank structure: slopes are generally between 1:1 and 2:1; comprised mostly of soil/earth (photo c).

Channel processes: limited deposition and bar development; and not much evidence of deposition at crossings; some deposition noted downstream of bank erosion (photo c) where sloughing banks contribute to local sediment accumulation.

Forestview Creek – Reaches 3, 2 & 1

Water quality (qualitative): generally stagnant, poor visibility and turbid in the 2 pools observed in August of 2008.

BIOLOGICAL CONDITIONS

Vegetation composition: The top of Reach 3 supports a sparse woody canopy with live oak, valley oak, and walnut dominating; downstream the riparian corridor becomes even less woody with blackberry, annual grasses, teasel, fennel, and doc dominating the banks and bed (photos c/d). The channel in Reach 3, both between the two pools and downstream of the pools supports a narrow band of cattails covering the entire channel bottom (photo b).

Riparian corridor and canopy closure: 20-30 ft. wide corridor on each bank with very limited canopy closure ranging from 0% (dominant case) to 25% (top of Reach 3).

Instream Habitat: Aquatic habitat in this reach is limited in the dry season by lack of surface flow. Only two pools were observed in August of 2008 and both were small and stagnant; the channel does not appear to maintain much complexity with limited bars, debris, or overhanging banks. In Reach 2 and 1 the channel bottom was difficult to distinguish from the banks due the high level of non-wetland plants growing in the channel proper.

Listed species with potential to occur: All three reaches are potential habitat for western pond turtle and moderate potential habitat for California tiger salamander.



(c) Reach 2, looking across the channel. The bank sloughing on the far bank is distinguished by a horizontal line of bare dirt. In this section, sloughed sediment from banks contributes to channel aggradation, and results in vegetated in-channel bars with non-wetland species.



(d) Confluence of Reach 1 and Peterson Cr., looking upstream. Forestview is the channel to the right and Peterson is the channel to the left. Both channels are dry (August 2008) and the channel bed is coated in a thin layer of dry white clay.

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Forestview Creek are limited to vegetation management in Reach 3 to reduce blackberry and cattail presence on the banks and in the channel. Some bank instability was noted in Reach 2 and Reach 1 (photo c), and this should be watched over time. All of the crossings look to be adequate from a conveyance perspective and there were no large bars that would constrict flows observed. All three reaches could benefit from additional canopy planting to increase shade, retard growth of emergent vegetation, and provide additional habitat benefits for a variety of riparian species.

Abramson Creek – Reaches 2 & 1

JURISDICTION: Owned and maintained by SCWA

LOCATION: Reach 2 begins ~2000 ft upstream of Guerneville Rd. crossing and continues to Guerneville Rd. Reach 1- Guerneville Rd. south to confluence with Santa Rosa Creek.

ADJACENT LAND USE: Vineyard, agricultural, undeveloped

UPSTREAM: Abramson headwaters not maintained by SCWA

LENGTH: Abramson 2: 1,922 ft.
Abramson 1: 3,701 ft.

CHANNEL EASEMENT CORRIDOR WIDTH:
Abramson 2: 66 ft.
Abramson 1: 117 ft.

AVERAGE TOP-OF-BANK WIDTH: Abramson 2: 55 ft.
Abramson 1: 82 ft.



(b) Mid Reach 2 looking downstream; note channel is inset 8-10 ft. below top of banks, abundant blackberry on left bank; flow is stagnant with dense algae due to cattails blocking channel (in distance) causing stagnant flow conditions (Nov, 2007).



(a) Upper Abramson Reach 2, looking downstream (south); steep banked trapezoidal channel with blackberry encompassing entire left bank, right bank has eroded (to left of person) and requires stabilization (Nov, 2007).

PHYSICAL CONDITIONS

Reach setting: Abramson Cr. is a local tributary to lower Santa Rosa Creek, draining agricultural areas on the Santa Rosa Plain; reach is a trapezoidal linear channel; upper Reach 2 begins at rip-rapped drop structure.

Active channel: bed width ranges from 8 to 12 ft., generally 10-12 ft. below top of banks; water depth 1 ft.

Bed sediments/texture: upper Reach 2 includes some sand and gravel at drop structure, then finer bed material of sands/silts throughout downstream. Grouted riprap at Guerneville crossing and at Santa Rosa Cr. Confluence.

Bank structure: Reach 2 steep earthen banks, generally 1:1 slope, with some bank erosion near location of photo a; Reach 1 less steep earthen banks at 2:1 (photos c/d).

Water quality: stagnant pools with dense algae in mid Reach 2 where cattails block flow (photo b); downstream in Reach 1 cattails also impede flow across channel (photos c/d).

Channel processes: At upper Reach 2, fast velocities past drop structure may have eroded right bank; otherwise channel is linear and trapezoidal down to Santa Rosa Creek confluence with uniform flow conditions.

Abramson Creek – Reaches 2 & 1

BIOLOGICAL CONDITIONS

Instream habitat: poor and limited instream habitat due to: large drop structure at head of Reach 2, Reach 2 has generally poor circulation and water quality with algae collecting (photo b), upper Reach 1 is blocked with abundant cattails (photos c/d), and drop structure at Santa Rosa Cr. confluence creates barrier.

Vegetation composition: ruderal vegetation, including grasses and star thistle, and blackberry dominate banks; willow scrub and riparian cover interspersed along reaches. Between 70% and 80% of the in-channel area is comprised of wetland vegetation. Of this wetland growth, emergent species dominate the lower portion of Reach 1 (photos c/d), while more riparian species are found from the upper portion of Reach 1 through the top of Reach 2 (photo a).

Riparian corridor and canopy closure: Tree cover is sparse and found mostly at the upstream portion of Reach 1 and along upper Reach 2. Willow scrub and oaks provide approximately 10-15% cover along the reaches.

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



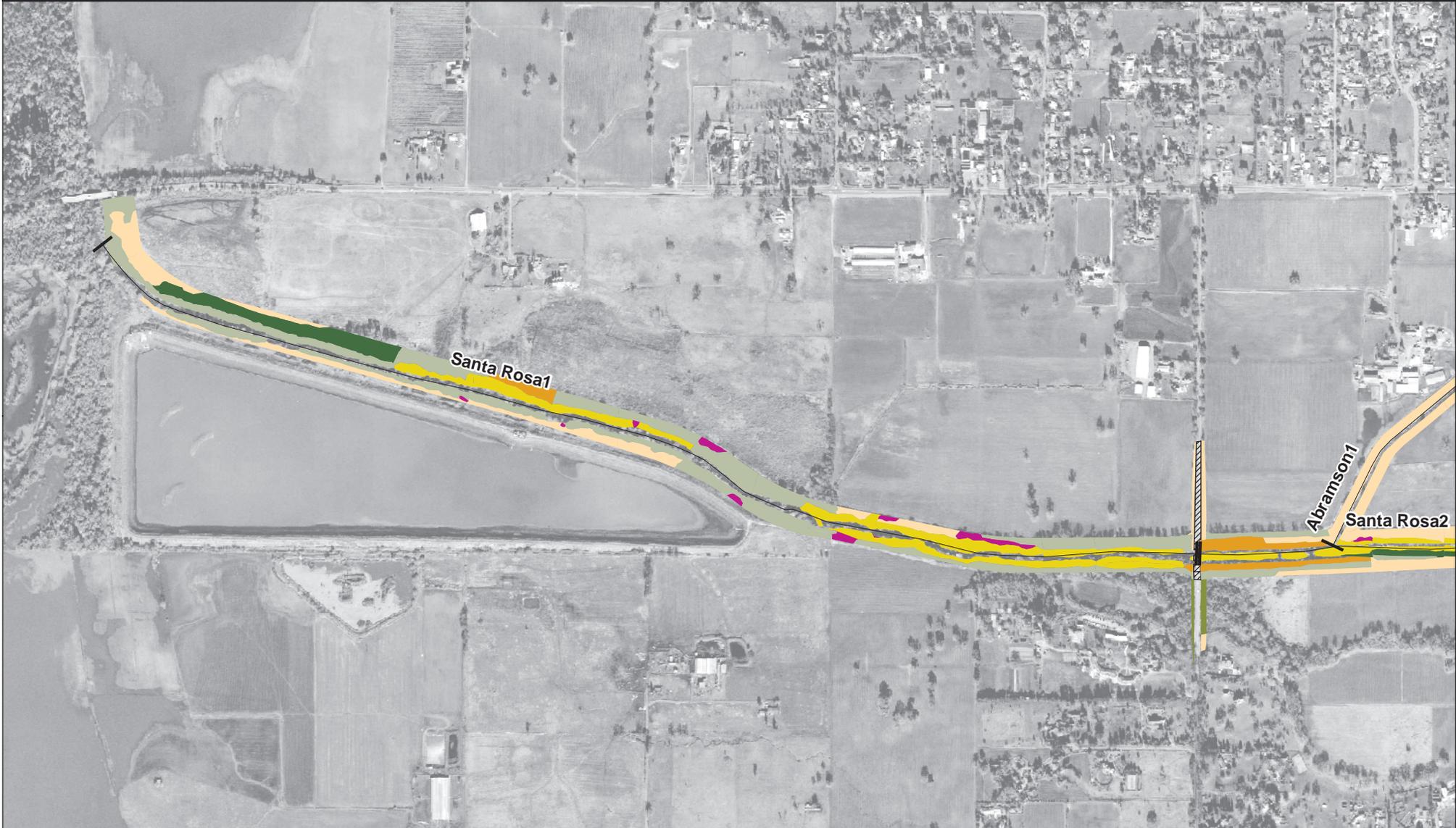
(c) Abramson 1 looking downstream from Guerneville Rd. crossing, cattails become abundant downstream of crossing, crossing has grouted riprap downstream for bank stabilization, (Oct. 2, 2008).



(d) Mid Reach 1 looking upstream, abundant cattails continue into mid Reach 1, with little riparian canopy cover, homogenous channel environment, trapezoidal banks sloping at 1:1 (Oct. 2, 2008).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Abramson Creek Reaches 2 and 1 are focused toward the following activities: repair of eroding bank in upper Reach 2 (near location of photo a); clearing of cattails in lower Reach 2 that are creating poor water circulation and algae development; and clearing of cattails in upper Reach 1 (photos c/d) which are covering entire channel bed. Opportunities to plant and create a greater riparian canopy exist throughout reaches, especially lower Reach 2 and upper Reach 1. Opportunities to remove other non-native choking vegetation including blackberry and thistle exist as well at these reaches.

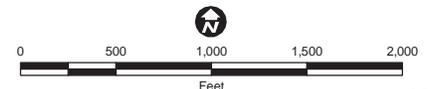


Vegetation Type

- 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

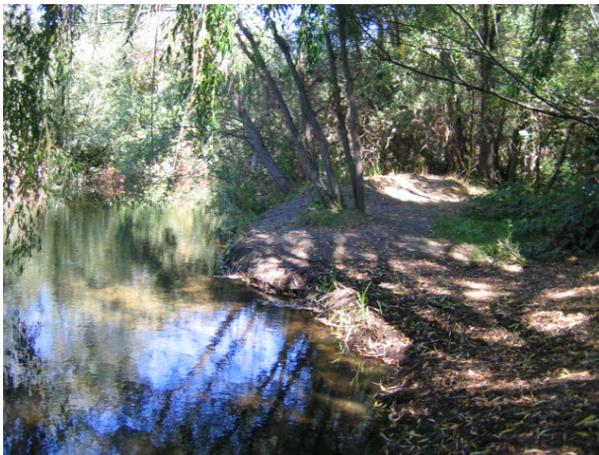
FIGURE 4-22
Reaches and Vegetation
Santa Rosa (13 of 13)



1 inch equals 1,000 feet

Santa Rosa Creek – Reach 1

JURISDICTION: Owned in-fee by SCWA
LOCATION: Willowside Road to Laguna de Santa Rosa
ADJACENT LAND USE: Agriculture/Grassland and Percolation Ponds
UPSTREAM: Santa Rosa Creek Reach 2
LENGTH: 8,434 ft
CHANNEL EASEMENT CORRIDOR WIDTH: 261 ft
AVERAGE TOP-OF-BANK WIDTH: 152 ft



(b) Middle of Reach 1, standing on the banks looking at a large deep pool and adjacent low floodplain (8/21/08).

MAINTENANCE HISTORY



(a) Reach 1, looking downstream from the Willowside Road Bridge (8/21/08).

PHYSICAL CONDITIONS

Reach setting: Reach 1 flows westerly through pasture land into the Laguna de Santa Rosa. This reach is the final transition reach between the larger upstream Santa Rosa Creek watershed and the low gradient marshy habitat of the Laguna. This transition is evidenced by the channel in this reach being dominated by a wide, slow moving channel with low banks (5-8 ft vs. 25-30 ft in Reach 2 and 3) and heavily vegetated stringer floodplains on both sides of the channel.

Active channel: 10-15 ft wide downstream of Willowside increasing to 25-35 ft wide upstream of confluence with Laguna. Through both reaches channel depths range from 2-6 in. along most of the channel with depths of 2-6 ft at the two large pools below drop structures (photo b).

Bed sediments/texture: dominated by fine sands, silt, and clay with occasional pockets of small gravel.

Bank structure: slopes are generally between 3:1 or less and earthen (photos b and c).

Channel processes: Unlike Reach 2, sediment deposition in Reach 1 appears to be generally limited to fine sediments on the adjacent floodplains, with no evidence of large bars within the active channel. It appears that the low banks and regularly inundated floodplain play a major role in creating the marshy, backwater conditions in this reach.

Santa Rosa Creek – Reach 1

Water quality (qualitative): Upstream segments clear (photo a and b), lower segments become green and turbid (photo d).

BIOLOGICAL CONDITIONS

Instream Habitat: Aquatic habitat in Reach 1 consists of both large open water areas with deep water (>3 ft deep) and shady banks with dense overhanging vegetation (photos a and d) punctuated by deep shady pools and complex in channel wood features (photo b and c). Conditions are ripe for a wide array of amphibians, reptiles, and fish.

Vegetation composition: The reaches supports dense stands of woody riparian vegetation along much of both banks with arroyo willow and weeping willow at the channel margins and a mix of oaks, willows, alders, and other tree species along the low floodplain and banks (photo a and d). Understory is dominated by blackberry with ivy or fennel in areas with open canopy and closed canopy areas are dominated by a variety of herbaceous plants including shade tolerant grass and sedges (photo b and c).

Riparian corridor and canopy closure: The reach supports either a dense, narrow riparian corridor or a wider riparian floodplain on both banks for much of its length. The corridor ranges from ~15 to 75 ft wide on each bank with canopy closure ranging from 10%-90% with most areas containing between 25-50% closure.

Listed species with potential to occur: Steelhead and Chinook are known from this reach and steelhead may rear in some of the deep shaded pools along this reach. This reach contains suitable habitat for a host of special status amphibians, reptiles and birds.



(c) Middle of Reach 1, looking downstream from a shady floodplain into a diverse and complex stream segment with overhanging vegetation and significant woody debris along the banks (8/21/08).



(d) Lower Reach 1, looking upstream at a typical open section where flow is nearly stagnant and condition reflect a strong backwater, lagoonal channel geometry (8/21/08).

MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management opportunities for Reach 1 are colored by the lack of infrastructure threatened by overtopping creek banks and a quasi functioning mini-floodplain adjacent to the channel in many locations. The only significant infrastructure near Reach 1 is the large percolation pond adjacent to the southern bank. The pond is protected from the stream by a high ring levee and there was no evidence (observed in August of 2008) of high flows from Santa Rosa Creek threatening these levees. During reconnaissance in 2008, no major maintenance issues were noted.