

Purpose

The Board of Supervisors authorized the Department of Public Works to begin implementation of a County-wide Watershed Program on May 13, 2008. The purpose of the Watershed Program is to provide a framework to integrate flood protection and environmental restoration with public and private partners to protect and enhance Marin County’s watersheds. In the Gallinas Creek Watershed, this program seeks to identify opportunities that provide the following benefits:

- Develop cost-effective solutions to reduce flooding damages that threaten communities, local economies, and public services
- Improve navigational access to lower Gallinas Creek
- Protect, enhance and restore sensitive creek and wetland habitat and water quality
- Identify multi-benefit type projects that will improve the County’s ability to compete for State and Federal funding
- Identify projects that are resilient to sea level rise
- Evaluate the beneficial re-use of dredged material for wetland restoration, levee maintenance and shoreline protection within lower Gallinas and Miller Creeks
- Reduce ecological impacts of flood maintenance activities

The Gallinas Watershed Program would identify and describe the recommended watershed improvement measures and provide details on project feasibility, sequencing, preliminary costs and funding strategies. It is anticipated that some type of revenue measure will be required to implement the recommended measures.

Background

The 5.6 square mile Gallinas Creek watershed has two main drainage basins. The mainstem to the north is the larger of the two drainages and flows from the ridgeline down through the Santa Margarita Valley and the community of Terra Linda to its confluence with the South Fork Gallinas Creek near McInnis Park. South Fork Gallinas Creek is fed by several small tributaries that originate in the San Rafael Hills and San Pedro Ridge and flow through the communities of San Rafael Meadows, Los Ranchitos and Santa Venetia.

Gallinas Creek - mainstem

During the construction of the Terra Linda housing development in the late 1950s and 60s, portions of upper Gallinas Creek and its tributaries were channelized and lined with concrete. Prior to the construction of the concrete channel, the Freitas family reported steelhead using the large pools in the creek. No steelhead have been observed in the upper reaches of Gallinas Creek since the channel was straightened and lined with concrete. The concrete lining of Gallinas Creek generates high water temperatures, which leads to excessive algal growth and poor water quality entering the Gallinas Creek Slough.

Moving downstream of Highway 101, development becomes progressively denser, with the lowland areas east of Highway 101 supporting neighborhoods, industrial and commercial development. Portions of these lowland areas are within FEMA's mapped 100 year flood plain. While these areas may not have been impacted from the floods of 2005/06, sea level rise poses a potential threat to this area. There have been local efforts to restore wetlands in this area. Audubon completed a small wetland restoration project on State Lands during the 1990s. Gallinas Creek joins South Fork Gallinas Creek at McInnis Park.

South Fork Gallinas Creek

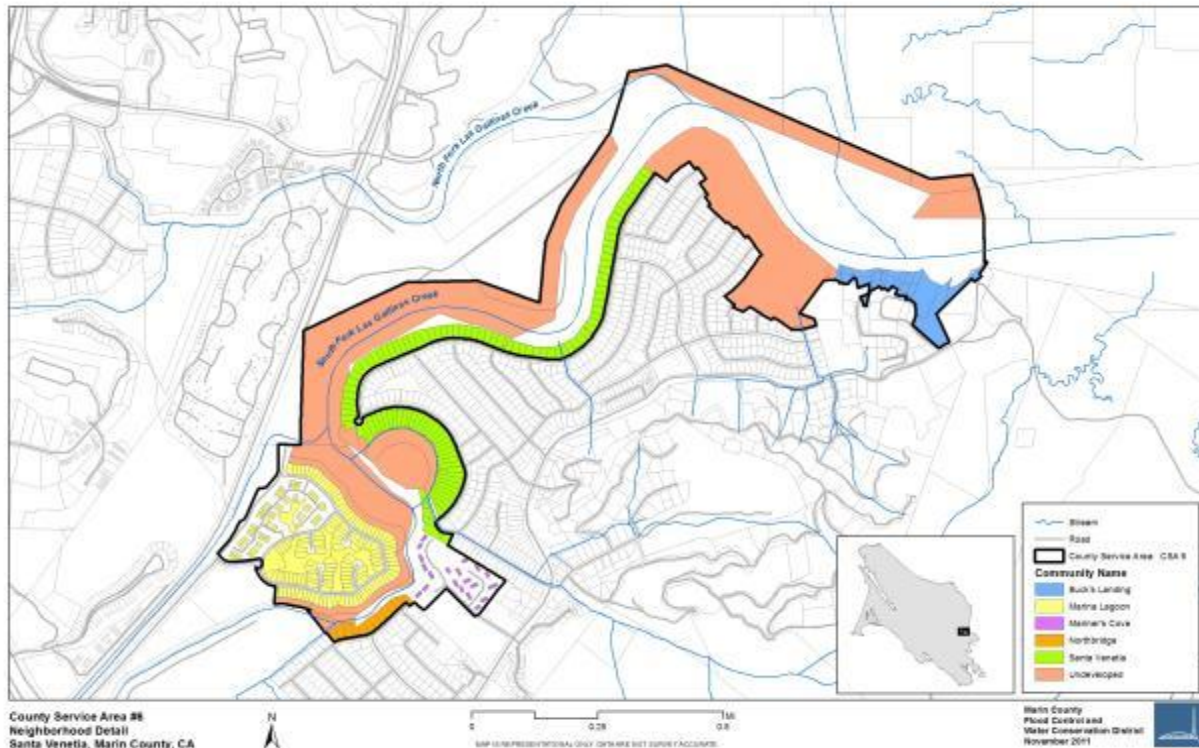
There are two designated County Flood Zones that drain to the South Fork Gallinas Creek: Flood Zone #6 and Flood Zone #7.

Flood Zone #6 was established after construction of the San Rafael Meadows subdivision in the 1960s. This is a very small zone located just west of Highway 101 across from the County Civic Center. Houses were built in a low-lying area and experienced frequent flooding until improvements were made. In the early 2000s; during the construction of a new subdivision project, a majority of the stormwater causing the flooding was rerouted around the community thereby eliminating a significant cause of flooding in the zone. Moreover, the Flood Zone #6 area was annexed by the City of San Rafael. The City now owns and is responsible for the maintenance of the Zone's drainage facilities.

Flood Zone #7 is comprised of the unincorporated community of Santa Venetia, east of Highway 101 along San Pedro Road. Santa Venetia was one of the first developments in Marin County to be constructed on fill over bay mud and occurred in an era before the County had the authority to regulate or control development. Due to the low initial elevation of the fill and the compressible nature of the underlying bay mud, the area has subsided and is now below the high tide level. To protect themselves from tidal flooding of Gallinas Creek, the residents of Santa Venetia formed Flood Control Zone #7 in 1962. The annual maintenance program for facilities includes pump stations and levees, as well as other drainage facilities in the Zone.

Though the Santa Venetia neighborhood did not flood during the 2005 New Year's Eve storm, sea level rise, land subsidence and aging infrastructure remain key flood protection challenges. Stormwater is collected via pipes and discharged into Gallinas Creek via a series of five pump stations. Four million dollars of potential flood protection improvements have been identified within Santa Venetia alone. The most pressing identified infrastructure need in Santa Venetia is the replacement of Pump Station No.2. It is recommended that the pump be rebuilt to improve its reliability and to increase its pumping capacity to handle the 100-year storm event (It currently can handle flows up to the 10-year event.) A special election was held in 2010 to fund flood

protection improvements in Flood Control Zone 7 including the replacement of Pump Station No. 2, improvements to Estancia Ditch, and additional levee studies. The tax measure was not approved. The District is now investigating the feasibility of pursuing revenue sources for the replacement of Pump Station No. 2.



County Service Area No. 6 in the Gallinas Creek Watershed

Homeowners along the tidal reaches of Gallinas Creek also desire creek access and a navigable channel. The community formed CSA #6 (see figure above) in the 1960s to dredge the channel for navigation and flood protection. The community is working to raise the funds to perform another round of maintenance dredging. Preliminary plans and cost estimates have been developed. The estimated dredging construction costs exceed funds available and will require additional funds to implement.

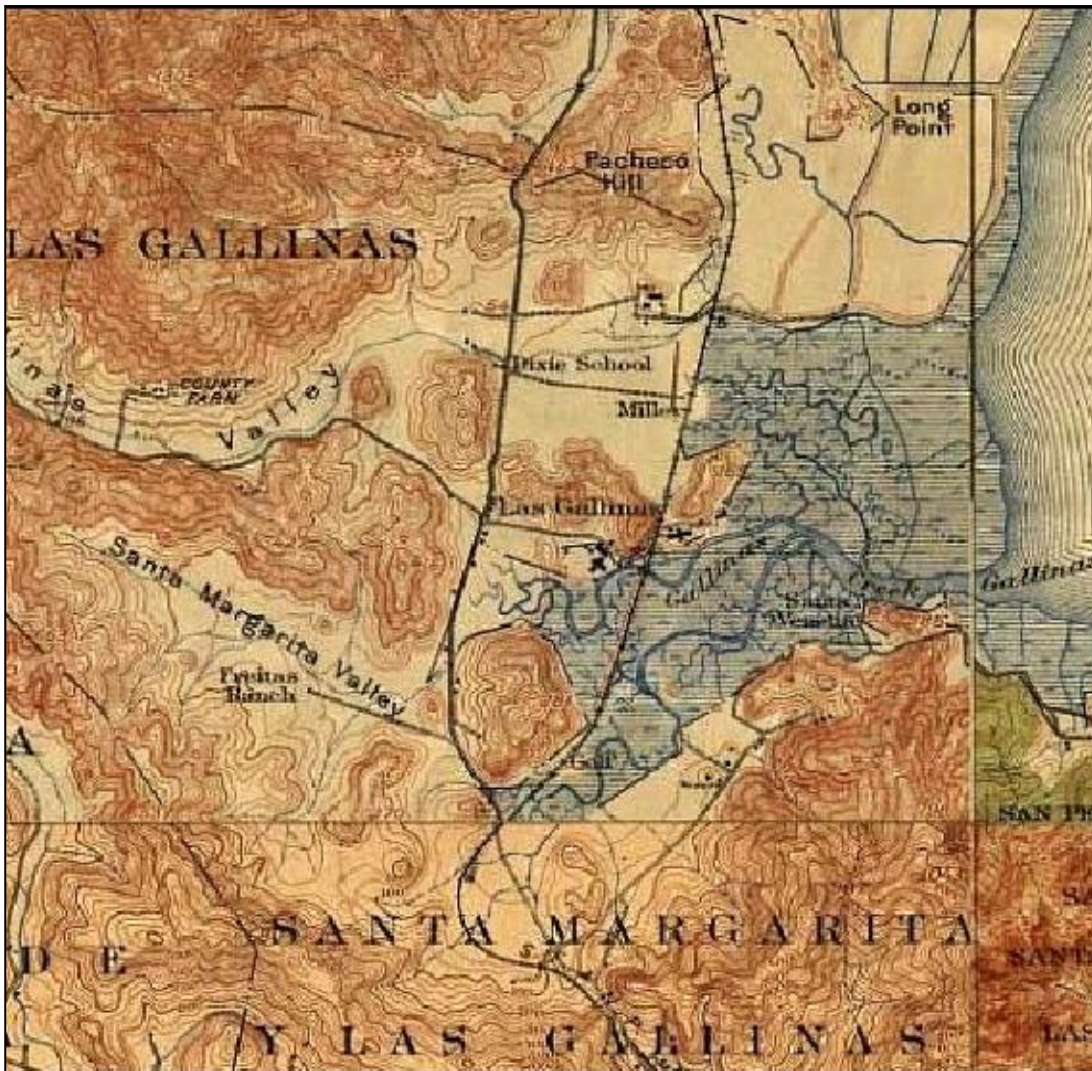
Mouth of Gallinas Creek

The mouth of Gallinas Creek is bordered by County and State Park lands. The beneficial re-use of sediment from the dredging of Gallinas Creek could be used to restore diked baylands to functional tidal marsh. The Army Corps of Engineers prepared a preliminary restoration plan for the McInnis Park Wetland Restoration Project in 2001, under Section 206 WRDA 1996 as an element of the San Pablo Bay Watershed Restoration Plan. Suggested restoration actions include levee breaching, marsh plain and channel grading and invasive species removal.

Tidal marsh restoration in the Gallinas Creek system would restore ecosystem function and processes, as well as provide critical habitat for the endangered California clapper rail and salt marsh harvest mouse. The opportunity exists to evaluate alternatives that could improve any project's resiliency to predicted sea level rise scenarios.

Miller Creek – Baylands

The tidal reaches of lower Miller Creek, which shares its outlet to San Pablo Bay with Gallinas Creek, will be considered as part of the Gallinas Watershed Program study area. Historically, Miller Creek discharged out onto a large flood plain without a clear channel connection to the bay. In the 1920s, Miller Creek was rerouted, channelized, and leveed to provide space for agricultural fields. The current alignment rerouted the creek to the south and placed it into a narrow, leveed channel with two 90-degree bends before reaching San Pablo Bay. Las Gallinas Valley Sanitary District uses the creek as its discharge point during winter months at the downstream bend. Because these two creeks share a floodplain along San Pablo Bay, a concurrent planning effort to evaluate sediment movement, tidal prism and tidal marsh restoration is practical, sensible, and cost-effective.



Historical map of the wetlands at the mouths of Gallinas and Miller Creeks

Stakeholder Outreach

The watershed program will utilize a collaborative, iterative process to develop an integrated flood protection and habitat restoration program. The Marin County Board of Supervisors recommended establishing stakeholder committees at three levels to support community outreach and to provide overall program direction. A broad community outreach program is also recommended.

Community outreach will be developed around two key messages:

- The watershed approach is the practical and desired alternative to identifying cost effective solutions for improving flood protection; and
- Implementation at the watershed scale takes time and does not take precedence over the maintenance and rehabilitation of aged existing infrastructure.

Description of Gallinas Watershed Stakeholder Committees

Policy Advisory Committee - This group of elected officials is comprised of the District County Supervisor, two representatives from the participating city council and the Board of Directors of the participating agencies. This committee provides policy input on program direction and community issues and will meet 1-2 times per year.

Operations and Finance Committee - The participating District manager and/or city manager and the Marin County Public Works director will use these meetings to evaluate progress and prioritize funding strategies and will meet 3-4 times per year.

Technical Working Group - This group includes technical experts and community members with science and technical backgrounds from local watershed groups, homeowners' associations, and conservation organizations, and staff of participating State, Federal and local regulatory and participating agencies. The group is responsible for reviewing watershed products and will provide input on issues, needs and watershed priorities. The TWG aims to meet at least quarterly to provide input and to review the development of work products..

Community Outreach

Quarterly watershed newsletters, targeted community meetings, presentations at various local boards and homeowners associations and utilization of the watershed program website (www.marinwatersheds.org) will support communication to the community at large. The program website provides dedicated information about the watershed and is regularly updated with notices about workshops, meetings, proposals and projects.

Program Description and Outcomes

The Watershed Program will build upon existing studies and develop new analytical tools to evaluate and quantify the extent of flooding and to evaluate the range of proposed solutions. This process will be summarized in a final report. The final report will also include recommendations on how to leverage local funds to attract State and Federal grant funds. The final report will provide an assessment of and describe the type of local revenue measures that could support project implementation.

The following is a description of the proposed tools and outcomes. An excellent overview of existing conditions and relevant studies is available at www.marinwatersheds.org.

Analytical Tool Development

The District has identified the general causes of flooding within the watershed but focused modeling and analysis will provide the ability to refine the engineering analysis required to develop conceptual designs for improvements and to get a better idea of the costs associated with implementation.

The following tools will assist with the identification and review of a range of alternatives:

Hydrology and hydraulics models - An understanding of how much water is moving through the watershed (hydrology), how fast it moving and where it is going (hydraulics) is critical to quantifying flooding impacts and identifying solutions. The development and use of computer models to quantify stormwater runoff and channel flow are the industry standard used to describe flooding. These modeling tools will allow us to identify areas that need increased flood protection and to understand how channel and floodplain modifications will influence the ability of the channel to carry flood flows.

Flood Zone 7 is actively engaged in a process with the Army Corps of Engineers (ACOE) to evaluate the levees that protect Santa Venetia. As part of this evaluation, the ACOE developed the following types of models:

- A hydrology model that develops flood flows from the watershed into the north and south forks of Gallinas Creek.
- A hydraulics model for the south fork of Gallinas Creek that evaluates both tidal and creek water surface elevations under flood flow conditions
- In addition, the Corps performed an evaluation of direct coastal flooding impacts under current and 50-year sea level rise conditions

Additional model refinements may be driven by the alternatives analysis.

In addition to the creek channel models described above, there are also specific stormwater models to evaluate flow in low-lying developed areas where the majority of flow is routed via roads and a storm drain system to stormwater pump stations. This type of model could be useful for evaluating storm flows in Santa Venetia because flood control practices rely on an underground storm drain system, pump stations and three direct stormwater bypasses to deliver runoff to Gallinas Creek. A stormwater drainage system model for Flood Zone #7-Santa Venetia could improve the efficiency of pump operations by providing information on pumping capacity and to evaluate the optimal distribution of flows to the five pump stations. This type of modeling would also evaluate stormwater pipe capacity and identify constriction points.

At the end of this phase, we will have a watershed based hydrology and hydraulics models of Gallinas Creek and limited tributaries that will allow us to review conceptual project alternatives for their benefits including an evaluation of sea-level rise scenarios.

Geomorphic and Sediment Assessment in Tidal Areas - Levees bordering lower Gallinas and Miller Creeks have greatly reduced the tidal prism (volume of water that moves in and out on each tide cycle) thereby reducing the ability of the channels to transport sediment out of the system. This has resulted in sediment deposition in the tidal reaches of the creek and a loss of depth for boating access. This assessment will seek to identify a channel width and alignment that maximizes the creek's ability to transport sediment to the Bay based upon geomorphic analysis of similar systems in the Bay. This information will be used to inform future creek dredging needs and extent of dredging. It will also benefit management of sediment flow to better protect sewer plant infrastructure and outfalls.

This study will build upon the existing 2010 Winzler and Kelly report prepared for CSA 6 and incorporate work recently completed by the US Army Corps of Engineers. We will review this report in more detail to understand the assumptions that went into this modeling. We anticipate completing this phase of work in one year.

Some of the questions we plan to answer through this study include:

- What are the potential causes of siltation in the Creek?
 - Levees and loss of tidal prism
 - Vegetation encroachment
- What is the siltation rate of the south and north forks based on historic dredging related surveys?
- What are the options for increasing tidal prism?
- What channel configuration will provide us with the most bang for our buck?
- Estimate shoaling and sedimentation rates

- What will be the impact of future sea level rise on this creek system?
- What options improve flushing flows to move more sediment through the system?

GIS-based mapping and database development- A geographic information system database will be developed to evaluate opportunities to restore creeks and wetlands. Existing data will be used to develop a watershed-scale database and maps to assist with project prioritization.

Conceptual Alternatives Development

One of the primary goals of this watershed program is to identify cost-effective alternatives for maintaining or improving the level of flood protection. Utilizing the tools developed through the watershed program, the District and the community will be able to evaluate a range of alternatives to identify practical and sustainable projects. The models will be used to analyze and develop the full range of feasible measures consistent with the program goals. Preliminary costs, flood protection benefits and habitat impacts and/or enhancements will be clearly identified through this process.

The watershed approach considers the development of multi-benefit projects as a basic tenet to ensure that project priorities are eligible for the broadest range of funding at the State and Federal levels.

Final Report

This document will describe the identified alternatives and documentation for each. Maps and graphics will support this analysis and the report will include recommendations and process for pursuing implementation, establishing priorities and funding.

Program Budget

Expenditures	Cost
Calibration of USACE Hydrology Model	\$10,000 (<i>this task is complete</i>)
Surveying	\$45,000
GIS Mapping	\$10,000
Hydraulic modeling	\$40,000
Santa Venetia Hydraulic Study & Alts Analysis	\$70,000
Geomorphic/Sediment Study	\$40,000
Alternatives analysis	\$60,000
Final Report	\$45,000
Project Management	\$45,000
Stakeholder Outreach	\$27,500
Total	\$392,500

Revenue

County of Marin	\$80,000
City of San Rafael (<i>proposed</i>)	\$80,000
Flood Zone 6	\$12,500
Flood Zone 7	\$80,000
CSA 6	\$60,000
Las Gallinas Valley Sanitary District	\$80,000
Total	\$392,500

Status of Local Agency Participation

To date we have received commitment and financial support from the following agencies:

- County of Marin
- Las Gallinas Sanitary District
- County Service Area 6
- Flood Zone 6
- Flood Zone 7

We are still pursuing commitment and financial participation from the following agencies:

- City of San Rafael

Gallinas Watershed Program Staffing: Roles and Responsibilities

Liz Lewis, Program Manager

- Manage overall schedule, budget and support team delivery of technical and outreach products
- Coordinate and ensure timely delivery of program elements including technical studies, stakeholder and community outreach
- Coordinate communication and funding with partners
- Organize PAC and Operations and Finance Meetings
- Coordinate input and review of technical studies and other Program deliverables with Division Manager, Assistant Director, Agency Partners and County Counsel

Laurie Williams, Project Manager

- Lead development of the Watershed Plan (WP) Framework
- Support development of Alternatives Assessment Report and inclusion into WP framework
- Lead regular team coordination meetings
- Coordinate review and development of WP technical chapters with engineering, planning staff and any consultants supporting plan development
- Coordinate review and facilitate discussion of draft WP documents with TWG
- Lead outreach efforts including development of TWG newsletters, web site, and presentations
- Organize and implement stakeholder and community meetings
- Lead development of GIS database to support restoration project planning and prioritization

Roger Leventhal, P.E. QA/QC Lead for Engineering Adaptation

- Lead development of empirical sediment study and outputs
- Coordinate internal and external communication required to complete technical studies and grant applications
- Coordinate and lead review of technical studies and other deliverables inc.FCZ7 and CSA6 projects relating to WP
- Participate in watershed team meetings, TWGs and other meetings
- Update watershed team related to H&H deliverables and milestones
- Provide briefings and updates to staff, partners and local jurisdictions
- Support grant writing efforts related to implementation of all of the above

Hannah Lee, Operations and Maintenance Supervisor

- Lead development of SWMM/interior drainage study for Santa Venetia

Dave Nicholson, Zone 7 Engineer

- Review GWP technical memorandums and other deliverables
- Provide watershed updates to FCZ7AB

Chris Choo, Resource Planner

- Review work products for grant opportunities to support Gallinas projects
- Lead habitat assessment and data analysis for restoration project planning

Neal Conatser, CSA 6 Engineer

- Coordinate consultant work for Gallinas Levee Evaluation and USACE H&H South Fork of Gallinas Creek:
- Review GWP technical memoranda and other deliverables
- Summarize funding needs and recommend financial strategies for project implementation
- Provide watershed updates to CSA6AB