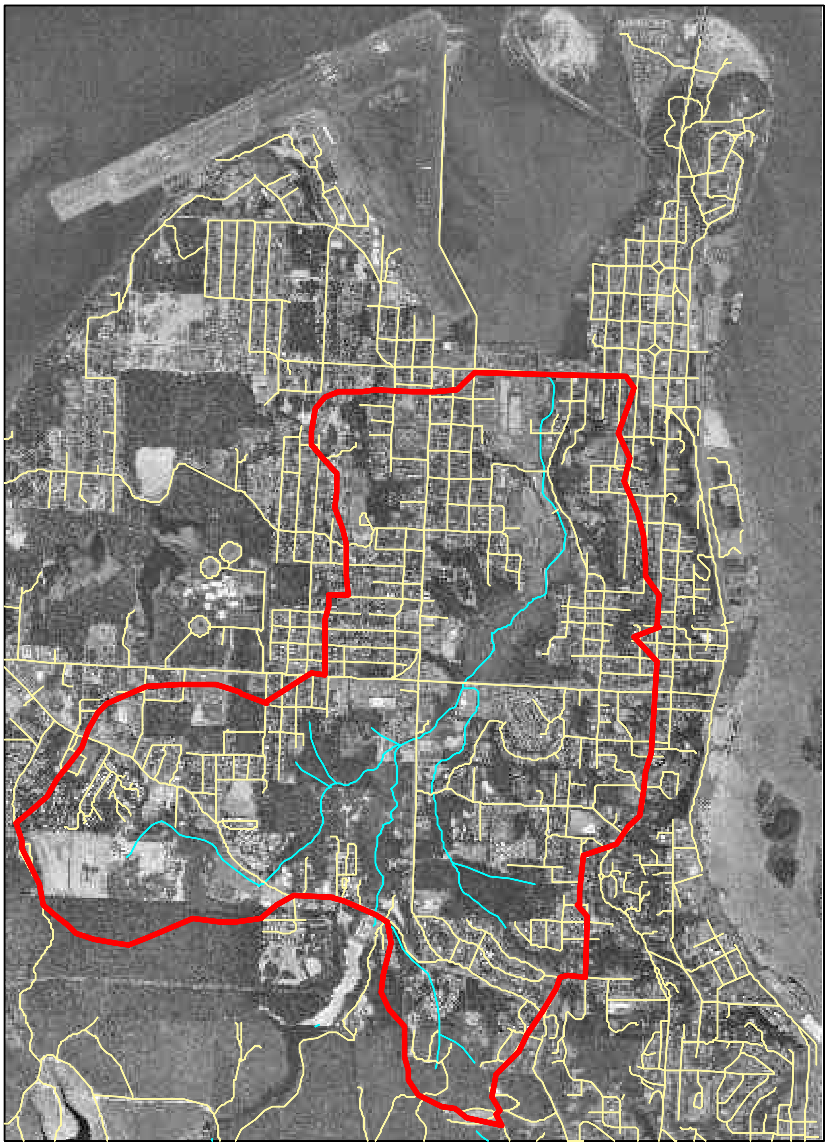
White Paper

Lower Pony Creek Watershed Assessment

and Potential Action Plan



Draft of May 16, 2002

Lower Pony Creek Watershed Committee

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Contents

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This report was commissioned by residents, business people and agencies who live and work in the lower portion of Pony Creek watershed (Figure 1). They are concerned about periodic flooding in several areas of North Bend; water quality of Pony Creek, which has deteriorated to the point where it was listed in 1998 as “water quality limited” due to high bacterial counts; and the loss of fish habitat that historically supported coho salmon, chinook salmon, coastal cutthroat trout, and steelhead, some of which are now protected by the Endangered Species Act. Concerned land owners and agencies met and determined that a study of the watershed, its problems, and possible solutions was needed if flooding problems and other concerns were to be remedied. Landowners and agencies provided funds to hire consultants who prepared a watershed assessment and action plan. This document summarizes the major findings from that report, with additional material considered important by the Lower Pony Creek Watershed Committee. The intent of this document is to provide a brief, clear overview of the problems in Lower Pony Creek.

WHAT IS REASONABLE TO EXPECT FROM PONY CREEK?

A healthy urban watershed provides an environment where rainfall does not cause property damage or impede commerce, where water quality standards are met, and where native fish and wildlife successfully coexist with humans.

Urbanized watersheds cannot retain their natural predevelopment hydrological and ecological characteristics. Therefore, development must be designed to achieve a fit between water inputs, transport and storage, and outflow into Coos Bay after development has occurred and into the future. Failure to accommodate these needs leads to problems of flooding, water quality degradation, and destruction of fish and wildlife habitat.

Flooding

An urban watershed must retain enough of its hydrological function so that storm runoff does not produce flooding, erosion, and water temperature increases. Major changes in hydrological function result from reductions in vegetative cover, particularly if they are accompanied by an increase in impervious surfaces. In the Pacific Northwest, watershed function deteriorates when the percent of forested land drops below 65%. If impervious surfaces become greater than 10-20%, 2-year frequency storms will cause flooding similar to that which would have occurred in a 10-year frequency storm before development.

The elimination of wetlands and the confinement of streams to narrow channels in urban watersheds also increases flooding. Wetlands and streams with broad riparian areas act as buffers that reduce flooding by storing and gradually releasing runoff. Without these buffers, runoff is more likely to produce flooding.

It is virtually impossible to keep the percentage of impervious surfaces below 20% and the percent of forested land above 65% in urban watersheds. Instead, storm drain systems are built to direct, store, and control surface runoff to prevent flooding. Storm water control systems have three components: 1) a drainage network to collect runoff; 2) storage facilities to temporarily hold for infiltration or slowly release the collected water; and 3) outlets to streams or other water bodies sufficiently large to handle the amount of collected water, without causing localized flooding at the outlets or downstream.

Goals for Flood Prevention in Lower Pony Creek

- Future development will not increase flooding in lower Pony Creek.
- When possible, existing developments will be modified to reduce runoff and improve infiltration.
- Storm drain systems will reduce, not contribute to, localized flooding.
- Manage wetlands and storm runoff to minimize flooding.

Water Quality

There are several typical water quality concerns in Pacific Northwest urban watersheds. These include warm water temperatures, high levels of sedimentation, and bacterial contamination.

Water temperatures are affected by stream flows, water depth, shading of the stream channel, and recharge from available groundwater. The amount of water in a stream affects its depth and how rapidly it is warmed as it moves downstream.

Stream depth is also affected by the amount of silt deposited into the stream from adjacent banks and hillsides by surface runoff. Natural channels have an equilibrium between sediment inputs and their transport downstream called “dynamic stability.” Wetlands, if present, provide a safe place for sediment deposition. Urbanization increases sediment inputs, eliminates natural depositional areas, and decreases the ability of the stream to transport sediment downstream. In lower Pony Creek, these sedimentation processes produce shallower stream channels and plugged culverts, both of which increase flooding. Sedimentation also suffocates fish eggs and reduces the quality of gravel beds where salmon spawn. Decreased channel depths also allow terrestrial and wetland vegetation to encroach into a stream, which impedes water flow and contributes to flooding.

Bacterial contamination of an urban stream comes from a number of sources. Untreated human wastes introduce disease-causing pathogens into the water. Human wastes can enter streams from upsets (blockages), defective or broken lines, or sewage pump station failures, sewage volumes that exceed flow designs, or from leaking septic systems. Bacterial contamination also comes from pet wastes deposited along roads or left in yards where rains wash it into streams or storm drains and from wildlife such as deer and beaver.

At present, lower Pony Creek does not meet bacterial standards for bodily contact for fresh water, and the downstream shellfish growing areas in the Coos Bay estuary often do not meet bacterial standards.

Goals for Water Quality Improvement in Lower Pony Creek

- Water quality standards will be met for temperature, turbidity, and bacteria.
- Sedimentation will be controlled through Best Management Practices (BMP) and nuisance regulations.
- Stream banks will be vegetated to provide shade for the stream channel and buffer zones for runoff.

Fish, Shellfish, and Wildlife

Urban watersheds in the Pacific Northwest contain valuable salmon and sea-run trout stocks, shellfish, and native terrestrial wildlife, some of which are listed as threatened under state and federal Endangered Species Acts. Even as urbanized as lower Pony Creek is, deer, beaver, waterfowl, eagles, and osprey, as well as numerous species of small mammals, songbirds and reptile and amphibians, inhabit the area.

Salmon are considered the bellwether species for good stream health in the Pacific Northwest. Salmon need unobstructed streams for migration during spawning, clean gravel in which they place their eggs, cool water for incubation and juvenile rearing, food (e.g., insects), and hiding places from predators. Urban watersheds have the ability to provide for these needs if sedimentation is controlled, barriers to migration are removed, adequate stream flows are provided, some wetlands are present, and large woody debris and boulders are able to create complex pools and gravel bars.

The effects that urban watershed alterations have on these species are not just aesthetic. The decline of the salmon fishery has cost Oregon thousands of jobs and billions of dollars. Lower Pony Creek is designated as Essential Salmon Habitat by the Department of State Lands because it has supported runs of coho salmon, chinook salmon, coastal cutthroat trout, and steelhead. Additionally, Pony Creek empties into Pony Slough, a component of Coos Bay, which is the largest producer of oysters in Oregon. Finally, the crab fishery, a vital component of the local economy, is dependent upon good water quality in the bay, because it is a nursery for young crabs.

Goals for Fish, Wildlife, and Shellfish in Lower Pony Creek

- There will be no migration barriers below Merritt Dam. Migration above Merritt Dam is not required because mitigation has been provided by the Coos Bay-North Bend Water Board.
- Spawning grounds will be sufficient in terms of number and condition for successful native fish spawning and egg incubation.
- Water temperatures will be within the desired range for juvenile fish ($\leq$64ºF).
- Bacterial contamination from lower Pony Creek will not degrade water quality in the Coos Bay estuary to the point where oyster harvest or native shellfish production is curtailed.
- Wetlands are present for waterfowl and beaver; and riparian vegetation provides habitat for songbirds, small mammals, amphibians and reptiles.
- Pony Creek will be ecologically complex to provide varied habitats to support native fish.

WHAT CAN BE DONE TO IMPROVE LOWER PONY CREEK?

Restoration efforts must concentrate on activities that mimic key aspects of original watershed function. Reducing flooding, improving water quality of Pony Creek and its tributaries, and restoring fish and wildlife habitat will need a combination of public, private, and personal efforts, both in the short- and long-term. Many of these activities can best be accomplished through partnerships among government, private landowners, and residents of Lower Pony Creek.

Public and Private Partnership Actions

A key result of the Lower Pony Creek Watershed Assessment and the partnership process used to create it is that many actions needed to improve conditions in Lower Pony Creek can succeed only through partnerships among public agencies, private landowners and non-profit organizations: Specific partnership possibilities are:

1. ***Work to find mutually acceptable solutions to discourage development that confines stream channels or that lessens wetland buffering***. Properties that provide important multiple ecological and hydrological benefits should be identified and, if possible, acquired from willing sellers and enhanced for optimal hydrologic function. Specific areas that need protecting are:

   a) The large wetland complex north of Newmark Avenue;

   b) The K-Mart Creek and lower-Pony Creek sub-basins confluence;

   c) The wetland west of Woodland Avenue;

   d) The floodplain near the Woodlands Dental and Medical Complex; and

   e) The upper reaches of all streams.

2. ***Work collaboratively to reduce the amount of impervious surfaces throughout the watershed***. This could include requiring the use of pervious pavement on little-used areas such as overflow parking lots and limited-use roads and working with developers to encourage clustered developments.

3. ***Conduct restoration activities in the lower Pony Creek watershed***. These can include re-profiling steep stream banks; riparian plantings; re-establishing or broadening of wetland terraces; enhancing stream complexity by adding woody material, boulders, or other instream structures where appropriate; and the creation of additional side channel areas through vegetated areas and of off-channel linear backwater areas. The City of North Bend should apply for money to conduct a formal Local Wetland and Riparian Inventory and Assessment. This program, managed by the Oregon Division of State Lands, would provide a detailed plan on how to preserve and re-establish these habitats.

4. ***Consider relocation of Woodland Dental and Medical Complex to prevent flooding***. Because the Woodland Dental and Medical Complex is located in a floodplain, it will be very difficult to prevent flooding. The City of North Bend could consider a property trade with the Woodlands Dental and Medical Complex, potentially utilizing Federal Emergency Management Agency funding. A property swap would enable the owners to relocate, and this would allow this area to be restored to wetland, riparian, and floodplain habitats. This will help alleviate flooding downstream and will also create valuable juvenile salmon habitat.

Public Short-term Actions

Problems identified in the Woodlands Dental and Medical Complex and the Ken Ware/Coca-Cola Area can be lessened by:

1. ***Selectively manage beavers***. Beaver dams in the upper reaches of the watershed are beneficial when they produce wetlands. However, beaver dams in the lower sections of Pony Creek can cause flooding. Beavers and dams in the lower sections should be removed and the beavers re-located.
2. ***Remove sediment from the culverts under Waite Street and Newmark Avenue***. Construction of sediment-trapping basins just upstream from the culverts will reduce future sedimentation.
3. ***Carefully remove vegetation from Pony Creek that impedes water flow***. Identify where and how vegetation that encroaches on the Pony Creek channel can be managed by pruning and/or removal without removing vegetation necessary for stream shading and bank stability.

Public Long-term Actions

If the hydrological and environmental problems that exist in lower Pony Creek watershed are to be permanently corrected, a number of long-term activities are needed. These can be generally categorized as public education, ordinance building, and public infrastructure improvement.

1. ***Public Education***. The Cities are the primary point of contact for residents and contractors conducting activities that can affect Lower Pony Creek. The Cities can improve management by:
   a. ***Develop and provide fact sheets about good practices***. These can be passed out at the planning departments and for use as educational materials.
   b. ***Label storm drains to discourage dumping of pollutants***. Many urban communities have found that they can increase public awareness of the effects of dumping pollutants if they paint "Drains to Bay" and include a fish symbol on each drain opening. This is also low-cost means to involve youth in community programs.
   c. ***Develop an outreach program to inform the public about the water quality effects of pet wastes***. The Cities, along with individuals and groups, can educate the public about this source of pollution and explain why such action is necessary. Strategically placed municipal waste containers maintained by the city would help encourage this practice.
2. ***Ordinance Building***. Voluntary measures to improve water quality in Lower Pony Creek are preferred; however, if voluntary measures in inadequate, then the Cities of North Bend and Coos Bay may need to prepare ordinances to ensure compliance. While previous attempts to improve conditions through ordinances have been controversial, information found in the Lower Pony Creek Assessment and this White Paper can provide justification if needed and desired. Specific areas where water quality related ordinances may be needed are:
   a. ***Control of sediment during development activities***. The ramifications of development in floodplains should be closely examined for their effect on critical issues. Sediment-trapping basins should be installed upstream of problem culverts.
   b. ***Control of stormwater runoff from impervious surfaces***.
   c. Riparian vegetation to shade streams and protect streambanks from erosion.
   d. "Popper Scooper" ordinance to reduce fecal coliform pollution. If voluntary compliance to reduce the input of pet wastes fails to reduce coliform pollution of the creek and of Coos Bay, the Cities of North Bend and Coos Bay may need to enact an ordinance that requires dog owners to remove and properly dispose of feces produced by pets during walks.

3. ***Public Infrastructure Improvement***. Many adverse conditions in the Lower Pony Creek watershed are the result of improperly functioning infrastructure. Possible remedial actions include:

   a. ***Replace the tide gate at Crowell Lane***. Replacing the existing tide gate with a Self-regulating Tide Gate® or one that functions in a similar manner should lessen flooding at the Woodlands Dental and Medical Complex and the Ken Ware/Coca-Cola Area while still permitting fish migration.

   b. ***Control storm water discharge in the Newmark Boulevard area.*** Flooding could be reduced in the Ken Ware/Coca-Cola Area by either retaining storm water in the upper watershed or relocating storm water outfalls further below Newmark Avenue.

   c. ***Increase stream capacity in the Woodland Dental Medical Complex area***. Localized flooding in the Woodland Dental Medical Complex area could be reduced by either increasing the size of the culvert under Waite Street or to replacing it with an open-bottom arch culvert or a bridge/viaduct structure.

   d. ***Identify municipal practices that adversely affect water quality***. Identifying and remedying municipal practices, such as inadequate maintenance and repair of storm and sanitary sewer system, should help improve water quality.

4. ***Release water from the reservoirs to more closely mimic historic basin hydrology***. The Water Board should determine if the use and management of these reservoirs could be retrofitted to help alleviate flooding if consistent with their water supply objectives.

Private Actions

1. ***Use pervious surfaces for driveways and little-used areas such as overflow parking lots and limited-use roads***. Developers could reduce impervious surface area by making clustered developments. Roof runoff should be allowed to run over lawns instead of going directly into storm drains.

2. ***Construct water retention and flow dissipation structures in areas that produce excess storm runoff***. These structures will distribute runoff over a longer period, and this will reduce erosion and flash flooding. Detention basins/constructed wetlands adjacent to large areas of impervious surfaces such as shopping center parking lots could mitigate the effects of these surfaces.

3. ***Stabilize sediment on hillsides and stream banks***. Development on hillsides should use bio-engineering methods for site and slope stabilization. Stream banks should be vegetated to reduce erosion.

4. ***Plant vegetation along riparian areas***. A program of riparian planting should be conducted until all reaches of the Pony Creek system have developed mature and diverse vegetation.

Personal Actions

1. ***Reduce surface runoff into storm sewers and streams***. Homeowners can reduce surface runoff from their property by allowing water from rain gutters to spread over their lawns, using pervious blocks rather than concrete or asphalt for driveways and sidewalks, and by constructing swales to hold runoff.

2. ***Control surface runoff and erosion on steep slopes***. Steep, bare property should be terraced and planted to reduce surface runoff and erosion.

3. ***Remove pet feces from yards, parks, and walk ways***. Pet owners should be encouraged to remove feces from their backyards, to clean up after they walk their dogs, and to deposit pet wastes in toilets or garbage cans.

4. ***Properly dispose of used oil and other wastes***. Used oil and other wastes should be properly stored and recycled and should not be allowed to run down storm drains. The Cities of North Bend and Coos Bay should establish waste oil and hazardous chemical disposal/recycling facilities that are readily available to residents.

5. ***Control runoff of lawn chemicals***. Residents should be aware of the fate of runoff and lawn chemicals.

HOW DOES PONY CREEK WORK?

Pony Creek drains a coastal watershed into Coos Bay (Figure 1). The creek is 5 miles long, and it is divided by Upper Pony Creek Reservoir and Lake Merritt into an upper and a lower portion. The upper portion is a 2,496 acres drainage above the two reservoirs. This area is generally forested with moderate to steep hillside slopes. The Coos Bay/North Bend Water Board manages the upper portion and the reservoirs to supply the municipal water needs for the cities of North Bend and Coos Bay and surrounding areas.

The 1,362-acre lower portion, the area of concern for this report, is from the outlet of Lake Merritt above Ocean Boulevard to the mouth of Pony Creek where it empties into Pony Slough (Figure 1). Topography ranges from moderately steep hills in the southern reaches to tidal floodplains in the north.

There are three unnamed Pony Creek tributaries. For purposes of this report, they have been named “AAA Creek,” “K-Mart Creek,” and “Hospital Creek.” These three tributaries, along with lower Pony Creek itself, form the four sub-basins discussed in this report (Figure 1). The AAA, K-Mart, and Hospital Creeks sub-basins are relatively small areas (Table 1) that drain these tributaries. The lower Pony Creek sub-basin by itself comprises 48% of the watershed.

Two natural floodwater storage areas are produced by natural, well-established riparian/wetland areas. These wetlands are named the “Upper Pond” and the “Lower Pond” in this report (Figure 1). The K-Mart Creek and AAA Creek sub-basins, and the upper portion of the lower Pony Creek sub-basin, drain into the Upper Pond. The Lower Pond is a large, tidally-influenced wetland. The Hospital Creek sub-basin, the lower portion of Pony Creek sub-basin, and outflow from the Upper Pond collect in the Lower Pond. Lower Pony Creek is an unconfined, meandering stream with a relatively wide floodplain. The Creek’s bankfull width:depth ratio is low (typically less than 10), and this in combination with its low gradient (0.5-2%) makes it vulnerable to sedimentation. The lower stretches of the three tributaries are similar to Pony Creek, but they become steeper and less meandering, are more confined, and have larger bankfull width:depth ratios in their upper reaches. Stream widths range from 8 to 14 feet, and depths range from an inch or two to 6 feet. Stream flows are regulated to a large extent by water released from upstream reservoirs.

The stream and wetlands network has been modified by development. Just below Lake Merritt, Pony Creek has been redirected and placed in a confined, narrow, constructed channel. Other reaches have been confined and restricted by development. A large portion of K-Mart Creek is enclosed in culverts beneath the K-Mart parking lot. Culverts at Waite Road, Broadway and Newmark restrict flows of lower Pony Creek, and the tide gate at Crowell Lane prevents or limits tidal waters from entering the Lower Pond. In addition, wetland areas have been reduced by 87%.

Significant Alterations to Pony Creek Hydrology and Habitats

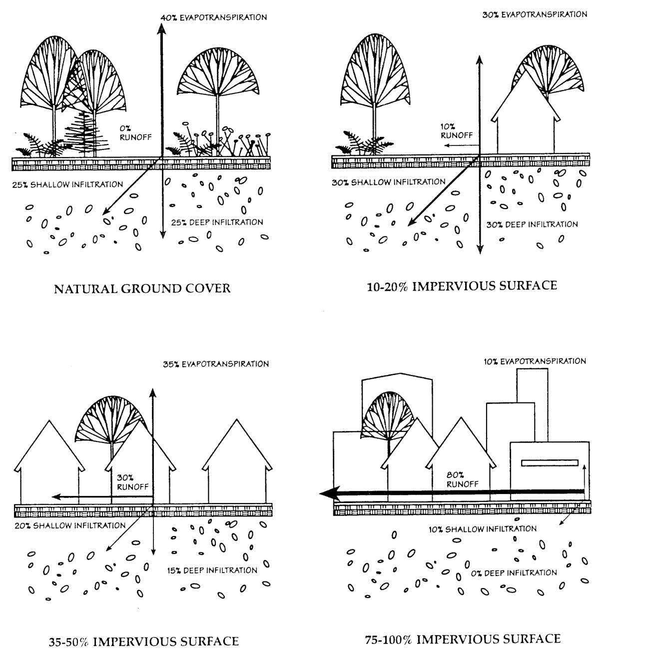
Watershed Alternation	Effects
Impervious areas have increased to 48%.	- Increases surface runoff. - Decreases water retention time outside the stream channel. - Prevents groundwater recharge that lowers summer water temperatures in the stream.
Riparian (streamside) areas have decreased as surrounding areas developed.	- Increases runoff. - Increases stream temperature.
Forest cover nearly gone.	- Increases runoff, and decreases recharge of groundwater. - Increases sedimentation. - Decreased upland water retention time.
Pony Creek channel altered and redirected.	- Simplifies stream habitat.
Wetlands have been substantially reduced.	- Reduces flood buffering. - Eliminates nursery areas for fish. - Decreases sediment storage area.
Reservoirs moderate upper watershed runoff.	- Natural channel development and sediment transport altered.
Tide gate at Crowell Lane alters water flow.	- Adult and juvenile fish passage impeded.
Undersized or plugged culverts restrict water flow	- Causes localized flooding. - Causes sediment deposition.

Rainfall and Runoff Relationships

Two things can happen to rain: 1) it is absorbed into the soil and is slowly released to streams as groundwater; <u>or</u> 2) it becomes runoff (Figure 2). Key criteria affecting runoff are the amount of rain and the absorptive capacity of the ground. During the later part of the rainy season when the ground is saturated, even small gentle storms can produce surface runoff.

Storm water runoff is the most important hydrological factor that must be managed in an urban watershed in order to mitigate flooding. If the volume of runoff water exceeds storage and transport capacity, flooding will ensue.

Figure 2. Effects of different levels of impervious surfaces on infiltration and runoff of rain water.



Urbanization can greatly increase the magnitude of runoff. Even brief, rainstorms can produce substantial runoff in urbanized watersheds. The construction of roads, sidewalks, parking lots, and buildings (roofs) creates large impervious surfaces where no rain is absorbed, so 100% of the precipitation becomes surface runoff immediately. Construction of houses and businesses also increases runoff because top layers of soil are removed or compacted during construction. This reduces the ability of the soil to absorb water which increases runoff.

Urbanization also reduces the amount of space available in the aquatic environment. Rivers and streams are often channelized and confined. Wetlands within urban watersheds are often drained and filled for development. These wetlands areas were previously regularly or permanently flooded. Hydrologically, wetlands act as sponges and store surface runoff, which reduces flooding. Wetlands slowly release stored water, which mitigates flooding and enables some of the water to enter the water table and subsequently into streams during the summer to keep water temperatures lower. By holding water, biological and chemical action in the wetlands removes organic and inorganic pollutants and suspended material is deposited. When wetlands are destroyed, runoff is directed downstream and causes flooding. Thus, the amount of riparian and wetland habitat is reduced and flows are directed downstream in narrow constricted channels.

Tide gates, large flap valves attached to the seaward end of a culvert or other supporting structure, are often installed on rivers or in estuaries to prevent brackish water from moving upstream during high tides and inundating low-lying areas. Tide gates are closed except for brief periods during ebb tides. The only time tide gates open is when the upstream water is higher than that downstream and if the difference in water height is large enough to push the heavy gates open.

Because urbanization alters runoff patterns, cities usually construct storm drainage systems to collect and direct storm runoff to prevent flooding. If the system is undersized, or becomes undersized due to subsequent developments, 2- or 5-year storms will cause flooding because the storm drainage system cannot handle the increased volume of runoff. Flooding can also occur if the volume of stormwater is concentrated and delivered to areas where the stream channel is too small to rapidly drain it off.

Runoff also causes erosion. When water moves across the ground, it dislodges and transports soil and other material. Development often removes surface soils and exposes sandy sub-soils that are vulnerable to erosion. When this material reaches a stream, it is deposited (sedimentation). Unvegetated banks are also susceptible to erosion.

CRITICAL ISSUES IN LOWER PONY CREEK WATERSHED

Development and Impervious Areas

The city of North Bend is bounded on three sides by water and by the city of Coos Bay on the fourth. Growth and development must be concentrated within these confined borders, meaning that the percent of impervious surface will increase over time. One quarter of the Lower Pony Creek watershed is commercially developed, and over 60% is residential (Table 1).

Table 1. Land use (in acres) in lower Pony Creek watershed based on zoning classification.

Sub-basin	Size	Commercial	Residential	Undeveloped
AAA Creek	37	1	37	0
Hospital Creek	186	88	97	0
K-Mart Creek	487	104	195	188
Lower Pony Creek	653	150	499	4
Total Watershed	1,363	343	828	192

Impervious areas in the lower Pony Creek watershed were estimated using "rules of thumb" based on zoning categories (i.e., a specific lot size has, on average, x % impervious area). Lower Pony Creek watershed is estimated to be about 48% impervious surface (Table 2). The AAA Creek sub-basin is the least developed, but even it has 28% impervious surface. Over half the surface area of the Hospital Creek and lower Pony Creek sub-basins are impervious.

Table 2. Percent impervious surface in lower Pony Creek watershed.

Sub-basin	Acres	Estimated Impervious	Percent Impervious
AAA Creek	37	11	28%
Hospital Creek	186	130	70%
K-Mart Creek	487	167	34%
LOWER PONY CREEK	653	341	53%
Total Watershed	1,363	649	48%

Loss of Wetlands

Historically, brackish and freshwater wetlands were a major feature in the lower Pony Creek watershed (Figure 3). All sub-basins contained freshwater wetlands. The lower Pony Creek sub-basin also contained a large estuarine wetland; over one-quarter of this sub-basin was either estuarine or freshwater wetland. The loss of wetlands in the lower Pony Creek watershed has reduced the watershed's ability to prevent flooding following a 2- or 5-year storm.

Table 3. Historic and current wetland acreage in lower Pony Creek watershed.

Sub-basin	1939		Present	
	Estuary	Freshwater	Estuary	Freshwater
AAA Tributary	0	3	0	0
Hospital Tributary	0	14	0	0
K-Mart Tributary	0	7	0	0
Lower Pony Creek	45	126	1	55
Total Watershed	45	149	1	55

Development has eliminated almost three-quarters of the wetlands. Historically, there were around 194 acres of wetlands in the lower Pony Creek watershed. This figure is probably low, because the aerial photographs used to make this estimate were taken in 1939, by which time agricultural development had already eliminated some wetlands. Today, only about 56 acres remain, a loss of 71% in just 63 years (Table 3). Not only has the total wetland area become less, but specific wetland types and their geographic distribution within the watershed have been even more heavily effected. Only 2% of estuarine wetlands remain after filling along Virginia Avenue, Pony Village Mall, and the North Bend Airport and Coast Guard Air Station. No freshwater wetlands remain in the AAA Creek, K-Mart Creek, and Hospital Creek sub-basins. The largest remaining portion of freshwater wetlands is located on either side of Newmark Avenue near Ken Ware Motor Co. and upstream to the area around Waite Street (Figure 4).

Increased Sedimentation of Pony Creek

Sedimentation of Pony Creek has decreased channel depth, which has reduced its ability to move large volumes of surface runoff; caused the water to warm more quickly in the summer; allowed terrestrial and wetland vegetation to encroach into the stream, which hinders water movement and, in turn, increases sedimentation and plugs culverts.

Sediment in lower Pony Creek comes from construction practices that remove the vegetation and that do not control erosion until a new plant cover is established. Areas of lower Pony Creek watershed that are vulnerable to erosion and that will lead to sedimentation are shown in Figure 5.

High Water Temperatures

The water quality standard for temperature is that streams will have a maximum temperature of less than 64ºF over a seven day moving average. As part of monitoring for the Water Board, the Coos Watershed Association has collected stream temperatures at 8 sites in lower Pony Creek since 1999 (see Figure _). Temperatures are collected at 30 minute intervals from the middle of June to the end of September. Table 4 shows the 7-day average maximum temperatures, the daily change in temperatures (illustrating warming and cooling), and the number of hours during the season when stream temperatures failed to meet the water quality standard.

Table 4. Stream temperatures in lower Pony Creek watershed, 2001.

Site	7-day Average Max. Temp.	7-day Max. Daily Change	Hours > 64ºF
AAA Creek	59.0ºF	3.3ºF	0
Ocean Blvd.	59.0ºF	2.1ºF	0
K-Mart Creek	69.9ºF	12.8ºF	266
N.B. Medical Center	58.3ºF	3.1ºF	0
Baughman (Hospital)	60.5ºF	3.2ºF	0
Pharmacy (Waite St.)	67.1ºF	8.0ºF	275
N.B. High School	75.8ºF	15.2ºF	1,179
Virginia Street	70.6ºF	6.3ºF	988

Table 4 shows that water enters the lower Pony Creek watershed well below the standard (although specific temperatures in upper K-Mart Creek are unknown). The AAA Creek sub-basin, Hospital Creek at the North Bend Medical Center (NBMC), and the outflow from Merritt Dam (Ocean) all had maximum temperatures of 59ºF or less during the summer of 2001. Not surprisingly, stream temperatures warm as the water flows downstream. The maximum temperature increased by almost 2ºF in Hospital Creek from the NBMC to Baughman's. While both the Ocean Blvd. site below the dam, and AAA Creek put water with a maximum temperature of 59ºF into the upper portion of lower Pony Creek, by the time the water reached the Pharmacy at Waite Street, the maximum temperature was over 67ºF, an 8ºF increase. Some of this increase is undoubtedly due to contributions from the warmer K-Mart Creek waters (maximum temperature of almost 70ºF. Between Waite Street and North Bend High School, water temperatures further increase another 8ºF, with a maximum temperature of almost 76ºF, 12ºF above the water quality standard. Tidal exchanges bring cooler water into the lowest sample site at Virginia Street, but maximum temperatures there are almost 71ºF.

The duration of temperatures above the water quality standard, and high daily temperature fluctuations, are both adverse to fish and other aquatic organisms. The high temperatures in the lower parts of Pony Creek occurred for over a thousand hours during the summer, 2001, equivalent to 49 days over the 101 days from June 21st to September 30th. The lower areas in the Pony Creek watershed also had very high daily swings in temperature. Daily changes were highest at North Bend High School (15.2ºF), and second highest at the K-Mart Creek site (12.8ºF).

Bacteriological Contamination

Pony Creek presently does not meet water quality standards for bacteria (*E. coli*) in its lower reaches. Bacteria comes into the watershed through a number of processes: human waste through malfunctioning municipal sewers and on-site disposal (septic) systems; domestic pet waste washed into the stream or discharged from storm sewers from lawns, parks and walkways; and inputs from beaver, deer, elk and various bird species. The exact proportions from each bacteria source is presently unknown, but a joint study among the Coos Watershed

Table 5. Bacterial contamination (*E. coli*) in the lower Pony Creek watershed.

Sample Site	# Samples	*Standard Exceeded*		Geometric Average	
		>126cfu	>406cfu	*E.coli*	Fecal Coliforms
AAA Creek	45	20%	7%	6.1	5.8
K-Mart Creek	49	22%	14%	7.3	5.3
Ocean Blvd.	47	17%	11%	1.09	0.37
Hospital @ Waite	51	45%	20%	79	31
Coca-Cola	91	60%	25%	147	58
N.B. High School	76	54%	22%	147	101

Association, South Slough National Estuarine Research Reserve, Marshfield High School and Oregon State University is attempting to determine this. Water samples have been taken over the last eighteen months at six sites in the lower Pony Creek watershed as part of this study.

Water quality standard for bodily contact is that the 30-day logarithmic mean level of *E. coli* is less than 126 colony forming units (cfu) per 100 milliliters (ml) of water, with no sample above 406 cfu/100ml. The water quality standard for fecal coliform in oyster growing areas is 14cfu/100ml, with no samples exceeding __ cfu/100ml. Table 5 shows the results of these samples to date, although we report averages (geometric means instead of logarithmic means) for both *E. coli* and fecal coliform.

Similarly to stream temperatures, waters enter the lower Pony Creek watershed in comparatively good condition. While each of the three upper watershed sites (AAA Creek, K-Mart Creek, and Ocean Blvd.) fail to meet the 126 cfu standard about 20% of the time, and fail the 406 cfu standard about 10%, as Pony Creek water moves downstream it picks up more bacterial contamination. *E. coli* levels exceed the 126 cfu standard between 45% (Hospital Creek) and 60% (Coca-Cola) of the time in the lower portion of the watershed. The 406 cfu threshold is failed over 20% of the time at all three sites. Moreover, if the North Bend High School site is indicative of contamination levels entering the Coos Bay estuary, average levels of fecal coliform (the oyster growing standard) exceed the standard by 7 times.

Tide Gate at Crowell Lane

A tide gate was installed years ago at Crowell Lane to prevent tidal waters from inundating the low-elevation areas of lower Pony Creek. If working properly, when the water level in Pony Slough is higher than that of the Lower Pond, the tide gate will not open. Consequently, if high rainfall occurs during high tides, runoff cannot flow into the bay and backs up behind the tide gate. The degree of flood behind the tidegate depends upon the magnitude of the storm , the tidal height at the time of storm water runoff, and whether the tide gates at Crowell Lane are functioning. Hydrological modeling was conducted by our consultant for two flood frequencies (storms occurring at 2- and 100-year intervals), for three scenarios: synchronous high flows and high tides, and offset (low tide, high flows) with the existing malfunctioning tide gate, and synchronous high tides and high flows with a functioning tide gate.

The results are shown in Table 6. Storms of a 2-year or greater magnitude will cause flooding (i.e., water above 6.0’ elevation). Particularly vulnerable areas are those near Ken Ware and the Coca-Cola Bottling Plant, and Woodland Dental and Medical Complex, both of which are located on filled wetlands (Figure 6). Currently, one of the three tide gates is chained open, so it doesn’t function as a tide gate. Hart-Crowser, our hydrological consultant, estimated peak height of the Lower Pond could be reduced to an elevation of 4.9 feet and 6.6 feet for 2-year and 100-year storms, respectively, with an operating tide gate. This effect is shown in the right two columns of Table 6.

Table 6. Effects of the Crowell Lane tidegate on flood elevations and duration of water above 6 feet in the Lower Pond.

Storm and Tide Event		Malfunctioning Tide Gate		Functioning Tide Gate	
Tide	Frequency	Water elevation	Duration > 6 feet	Water elevation	Duration > 6 feet
High	2-year	7.0 feet	1.5 hrs.	4.9 feet	0 hrs.
(Synchronous)	100-year	8.0 feet	2.3 hrs.	6.6 feet	1.0 hrs.
Low	2-year	6.6 feet	1.8 hrs.		
(Offset)	100-year	7.0 feet	2.3 hrs.		

Traditional tide gates can be barriers to migrating fish. However, alternative tide gate designs with improved fish passage features are available.

Storm Water Outfalls

Runoff that enters storm drains is transported via pipes to Pony Creek. There are a number of storm water outfalls, but many are concentrated in two locations: one is the area from Waite Street to Newmark; the other is near the mouth of Pony Creek and Pony Slough (Figure 6). Large volumes of water suddenly entering Pony Creek at these two locations could exceed the transport capacity of the creek and cause flooding. The upstream concentration of storm water outfalls occurs near two sites that are prone to flooding.

LAWS GOVERNING LOWER PONY CREEK

Clean Water Act

Section 404—Requires permits for discharge of dredge or fill material into water. Removal and fill permits come from DSL and COE. Permits to violate water quality standards in these permits come from DEQ.

NPDES—Regulates discharges of pollution through individual permits.

NPDES Stormwater Permitting—Provides general permits to regulate non-point pollution runoff from urban construction sites: Phase 1, 5-acre sites require permits; Phase 2 (starting March, 2003), 1-acre sites require permits.

Section 303d—Identifies when water quality standards are not met.

Temperature—Maximum 7-day moving average ≤64ºF.

Bacteria: ***E.coli***—Body contact: 30-day log mean = 126cfu/100 mL*; no sample >406cfu/100 mL.
Fecal coliform— In shellfish growing areas: median = 14 cfu/100 mL, and no more than 10% of samples >43cfu/100 mL.

***Endangered Species Act (ESA)*—**Protects habitat of species on list. Coastal coho salmon are listed as a threatened species. Lower Pony Creek identified as “critical habitat” for Oregon coastal coho salmon.

Essential Fish Habitat (EFH) —Salmon habitat cannot be modified if the species is listed under ESA.

Land Conservation and Development Commission —Sets up planning goals and works with municipalities to develop planning processes and a venue of appeal for removal from or filling in of streams designated EFH.

Coos Bay Estuary Plan (Coos County).