

Table 3.1. Causes of Impairment, Opportunities, and Constraints

WATERSHED ISSUE	CAUSES OF IMPAIRMENT	OPPORTUNITIES	CONSTRAINTS
<p>I. FISHERIES MANAGEMENT</p>	<p>A. Reduction in/Modification of Riparian Habitat: development near streams can include modification of vegetative community structure (non-native species, invasive species, reduced species diversity) and/or clearing and conversion of streamside riparian habitat to non-vegetated surfaces. Destruction of the riparian habitat directly and indirectly impacts the aquatic habitat through:</p> <ol style="list-style-type: none"> 1. Reduced cover providing shade (temperature control and escape cover) 2. Reduced food supply (reduction in food supply/insect habitat) 3. Reduction in in-stream structures for fish escape and high flow protection (woody debris, other plant material) 4. Increased bank and surface erosion (removal of stabilizing vegetation roots, rainfall impact cover, and water uptake) 5. Reduced barriers to overland runoff water and associated chemicals (less roughness for trapping and infiltration and less infiltration due to degraded soil structure and lack of water uptake by plants) <p>B. Predation and Competition: introduction of predatory fish and habitat modifications can alter predation and competition mechanisms.</p> <ol style="list-style-type: none"> 1. Reduction in populations of sensitive and endangered species 2. Changes in community structure <p>C. Invasive Aquatic Plant Species: introduction of non-native/invasive species can alter the entire habitat</p> <ol style="list-style-type: none"> 1. Excessive shading preventing maintenance of a good food supply 2. Excessive cover and visibility effects on predation and competition behavior 3. Dissolved oxygen impacts (reduced aeration, photosynthesis/respiration function modifications) 4. Nutrient uptake then release (when die off) at sensitive times of the year (microbial degradation oxygen demands) 	<ul style="list-style-type: none"> ❑ Dry Creek Parkway ❑ Federal and State Special Status Species protection (steelhead) ❑ Linda-Cirby-Dry Creek Flood Mgt. Plan ❑ Publicly owned lands in Roseville and Rocklin ❑ Conservation easements ❑ Flood mgt. program – buying properties and easements along Dry Creek ❑ NPDES Phase II permits: construction and post construction BMPs (>1 acre development) ❑ Building restrictions within 100-yr floodplain 	<ul style="list-style-type: none"> ❑ Public acceptance of access restrictions (e.g., no undeveloped stream crossing) ❑ Livestock owners implementation of animal exclusions – acceptance, funding, ease ❑ Diverse/competing issues regarding flood management and fish habitat ❑ Data gaps: flow, effects of flow, major contributors ❑ Beavers are cute ❑ Funding ❑ Grandparented buildings/access in 100-yr floodplain ❑ Canals – locations and management

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	<p>D. Flow Regime Impacts: changes in flow can arise from development activities that increase impervious surfaces (paving and compaction), route runoff water faster (impervious surface connectivity, storm sewers), and reduce water storage (filling in depressions, modification to vegetative water uptake). These processes affect the aquatic environment by:</p> <ol style="list-style-type: none"> 1. Changes in timing and duration of peak flows 2. Changes in total flow volume and velocity 3. Change in depth of flow 4. Possible scour of bed gravel due to faster flow 5. Negative impacts to spawning habitat and behaviour <p>E. Flow Regime Impacts: channel modifications (e.g., channelization) and constrictions (e.g., bridges and culverts) can impact fish support by:</p> <ol style="list-style-type: none"> 1. Changes in flow velocity (migration, benthic macroinvertebrate survival) 2. Change in depth of flow (flooding) (light penetration, fish stranding during recession, benthic macroinvertebrate survival) 3. Bank scour and erosion (sedimentation of stream bed, bank slump, reduction in escape/cover habitat) <p>F. Barriers to Fish Passage: beaver dams, unscreened water diversion structures, culverts, dams and other man made structures can prevent fish from migrating. Even if such impediments don't completely prevent migration, significant delays may:</p> <ol style="list-style-type: none"> 1. Expose migrating fish to increased predation and/or poaching (isolation from escape cover and escape routes) 2. Increase mortalities due to exposure to inappropriate temperature regimes and inability to escape 3. Increase mortality due to isolation from food sources <p>G. Placement of Structures: placement of structures (e.g., beaver dams, flood control dams, road crossings) can impair or destroy ideal fish and benthic macroinvertebrate habitat by:</p> <ol style="list-style-type: none"> 1. Physically locating them over ideal habitat 		

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	<ul style="list-style-type: none"> 2. Sedimentation behind the structure resulting in burial of ideal habitat 3. Changing important gradients necessary to maintain ideal habitat <p>H. Stream Channelization/Geomorphology: stream channelization for flood control and bank protection (armored sides), placer mining, flow regime modifications, and other modifications of the in-stream physical environment:</p> <ul style="list-style-type: none"> 1. Reduces channel complexity, habitat diversity, and cover causing a loss of pools, nooks/pockets, and woody debris for escape and food source habitat; bank undercuts for escape and cover; bottom roughness for food source habitat, spawning, and escape; and escape/protection from adverse flow conditions. 2. Changes flow regimes resulting in adverse flow conditions and negative impacts to spawning habitats. <p>I. Sedimentation: stream channel modifications, changes in flow regime, increased surface erosion, increased bank erosion, cattle/other livestock trampling banks, off road vehicles (ORVs), horses, and others can contribute to increased erosion, sediment transport into surface waters, and mixing/resuspension of deposited sediment. Impacts on fisheries include:</p> <ul style="list-style-type: none"> 1. Clogging of interstitial spaces of the streambed material reducing spawning habitat and macroinvertebrate (food source) habitat 2. Filling in of pools and runs that provide escape shelter and resting places during migration 3. Filling up the streambed and resulting in a shallower flow depth that is more likely to warm up faster and to a greater degree without deep waters being available for escape habitat (anadromous fish are very temperature sensitive and usually prefer cold waters) 4. Higher turbidities can clog fish gills, bury eggs and spawn, reduce light penetration, and consequently, predation/escape patterns, and affect dissolved oxygen. 5. Chemical associated with sediment (e.g., heavy metals, 		

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	<p>phosphorous) can be toxic to fish or contribute to excessive nutrient load</p> <p>J. Pollutants in Runoff Water: runoff quantity and quality to surface waters is affected by roads (heavy metals, petroleum products), developed communities (mixture), commercial (mixture), and industrial facilities runoff (variety), settled air pollutants, lawn chemicals (nutrients and pesticides), agricultural chemicals (nutrients and pesticides), and improper household chemicals</p> <ol style="list-style-type: none"> 1. Pollutants (e.g., heavy metals, pesticides) can be toxic to fish or fish food sources 2. Community changes can occur due to ability of more robust species to survive in degraded environments and higher nutrient load regimes. <p>K. Water Supply and Waste Water: water supply use varies: residential consumption, commercial use/waste water, agricultural irrigation, and others. Demand will increase due to higher future population and associated development and more people will generate more waste water</p> <ol style="list-style-type: none"> 1. Irrigation drainage can carry agricultural chemicals into waterbodies. 2. Increased generation of waste water will also increase pollutant loads to the system (nutrients, salts, other constituents). 		
<p>II. RIPARIAN AND FLOODPLAIN HABITAT MANAGEMENT</p>	<p>A. Reduction in Riparian Habitat Area: development and land use activities that result in reduction in riparian habitat area (e.g., clearing and conversion of streamside riparian habitat)</p> <ol style="list-style-type: none"> 1. Increases insolation (thus raising water temperatures), 2. Increases sedimentation due to bank erosion 3. Reduces riparian habitat continuity breaks up wildlife corridors 4. Increases edge effect <p>B. Vegetative Community Modifications: land use practices such as urbanization and agriculture modify the vegetative community by introducing non-native species, destruction of native species, and planting of less diverse communities. These practices:</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Conservation easements <input type="checkbox"/> Availability of native plants via local suppliers <input type="checkbox"/> Earth day? <input type="checkbox"/> Dry Creek Parkway <input type="checkbox"/> Restricted development in 100-yr floodplain 	<ul style="list-style-type: none"> <input type="checkbox"/> Building already existing in floodplains <input type="checkbox"/> No restrictions on development to stream bank if not in delineated 100-yr floodplain <input type="checkbox"/> Public acceptance and education

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<p>III. WATER RESOURCES MANAGEMENT</p>	<ol style="list-style-type: none"> 1. Directly reduce riparian habitat native species and community diversity 2. Indirectly reduce riparian habitat native species and community diversity through alteration of seed dispersal patterns 3. Increase vulnerability to invasion by exotic plant species 4. Reduce native aquatic community food supplies 5. Alter competitive dynamics between native wildlife species and introduced exotic predators and/or competitors <p>C. Reduction in Floodplain Habitat Area: development within the floodplain and floodplain modifications (e.g., levees) reduce floodplain habitat, which</p> <ol style="list-style-type: none"> 1. Changes local ecosystem communities (loss of native species, nesting birds, and breeding areas for insects) 2. Alters floodplain roughness, erosion, and stability characteristics <p>D. Changes in Flow Regime: increased flow, flooding, and scour due to flow regime modifications (e.g., development, waste water discharges, channelization, beavers):</p> <ol style="list-style-type: none"> 1. Loss of trees within the floodplain 2. Sedimentation impacts (lack of sediment deposition on floodplain and increased sediment transport downstream) 3. Bank erosion resulting in reduction of floodplain habitat area <p>E. Bank Erosion: livestock and human bank destruction contribute to</p> <ol style="list-style-type: none"> 1. Reduction in habitat area 2. Sedimentation <p>A. Flood Control - Stream Conveyance Capacity: morphology, meanders, roughness, slope, width, and topography affects stream flooding potential. Channelization often increases conveyance capacity (straight, smooth conduit), and meanders, floodplains, and in-stream fisheries habitat structures often reduce conveyance capacity</p> <ol style="list-style-type: none"> 1. Insufficient capacity can lead to flooding 2. Improving capacity may alter habitat and enhance bank erosion 	<ul style="list-style-type: none"> <input type="checkbox"/> Need to retrofit/redesign to handle high flow <input type="checkbox"/> Existing buffers <input type="checkbox"/> Restoration and vegetation enforcement activities <input type="checkbox"/> State and Federal special status species protections <input type="checkbox"/> Riparian management plans <input type="checkbox"/> Need to know flood potential for managing human resources and development or infrastructure <input type="checkbox"/> Dry Creek Watershed Flood 	<ul style="list-style-type: none"> <input type="checkbox"/> Cost (cattle crossings, fences) <input type="checkbox"/> Prioritization may be minimal – conflicting issues/needs and management strategies <input type="checkbox"/> Funding <input type="checkbox"/> Access for studies <input type="checkbox"/> 50- to 100-ft buffers <input type="checkbox"/> Not allowed to change 100yr flood plain/flow w/o FEMA approval <input type="checkbox"/> Not allowed to change downstream hydrology

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	<p>(non-armoured areas)</p> <ol style="list-style-type: none"> 3. Improving conveyance capacity may alter/eliminate floodplain habitat (e.g., levees) 4. Upland development could alter hydrology, rendering stream conveyance capacity insufficient 5. Flooding can revitalize floodplain habitat by depositing sediment on the floodplain <p>B. Flood Control – Floodplain/Flow Width: managing for floodplain habitat and flood storage, can increase floodplain area. Additionally, building restrictions within the floodplain also at least maintain floodplains. Widening/creation of floodplains</p> <ol style="list-style-type: none"> 1. Will increase flood volume storage capacity, if flow duration is not long, but it can also slow flows and cause localized flooding if constrictions prevent conveyance to downstream portions 2. Flooding can reduce sedimentation by scouring the streambed and depositing sediment on the floodplain 3. Increasing floodplain area and habitat may slow fast (artificially due to upland modifications) flows and resulting in flooding <p>C. Flood Control – Geomorphology: morphology (meanders, roughness, slope, width, and topography) affect stream flooding potential through conveyance capacity modifications. Channelization often increases conveyance capacity by straightening the flow path and reducing channel roughness.</p> <ol style="list-style-type: none"> 1. Slowed flows resulting in backwater effect and flooding 2. Reduced slopes can cause surcharging and 3. Enhanced fisheries habitat may slow stream flow resulting in flooding <p>D Flood Control – Constrictions: structures (e.g., culverts, bridge crossings) and aquatic habitat (e.g., woody debris, logs) affect stream flooding potential by slowing flows and creating backwater effects</p> <ol style="list-style-type: none"> 1. Slower flows reduces channel conveyance capacity and 2. Backwater effects create flooding conditions and sediment deposition at the constriction 	<p>Control Plan development included HEC-1 and HEC-2 models that provides a basis for flood flow modeling, including some cross sections and descriptions of constrictions</p> <ul style="list-style-type: none"> ❑ State and Federal Special Status Species protection ❑ DCCMG - trained personnel for water quality monitoring ❑ Established water quality monitoring program with necessary equipment ❑ Water Quality Standards and Criteria regulations – potential for TMDLs (Total Maximum Daily Load) requirements ❑ NPDES Phase II permits: Stormwater Management Plans ❑ Current flood 	<ul style="list-style-type: none"> ❑ No beaver management plan – difficult to manage ❑ Many changes have occurred since development of the DCW Flood Control Plan model was created and no assessment was done for pre-development conditions ❑ Conflicting issues/ needs and management strategies ❑ Existing infrastructure ❑ Unknown canal/ pond/ reservoir management ❑ Public acceptance and education ❑ Public involvement ❑ Unknown what actual flow regime is – few measurements of flow ❑ Little water quality monitoring data associated with flow

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	<p>E. Flood Control – Slope/Elevation Modifications: dams, debris jams, placer mining, and channel incision affect stream hydraulic slope. Reductions in slope will:</p> <ol style="list-style-type: none"> 1. Slow flows resulting in backwater effect and flooding 2. May provide barriers to fish passage (dams) or enhance fish habitat (debris) 3. Channel incision may lower the shallow groundwater table, modifying the moisture regime of the riparian habitat <p>F. Water Supply Impact - Growth: water supply infrastructure, source, and use quantity depends on land use:</p> <ol style="list-style-type: none"> 1. Increased urbanization and agricultural management often requires greater supplies of ground water or surface water that deplete one source or the other 2. Trans-watershed (from outside of the watershed) water supplies/withdrawals change local hydrology (irrigation, drainage, canals, waste water) 3. Reduction in ground water levels are possible if there is increased reliance on this resource for water supplies 4. Use of surface water within the watershed can reduce ground water recharge since the Dry Creek watershed straddles the recharge zone <p>G. Stormwater Impact – Land Use Modifications: stormwater flows/runoff are modified based on landuse, which usually results in more impervious surfaces that are directly connected</p> <ol style="list-style-type: none"> 1. More impervious surfaces will often increase peak flows and flow volume 2. Higher peak flows require infrastructure designed to handle the flow volumes; older systems may be under-designed for new flow volumes/rates <p>H. Wastewater Impact – Land Use Modifications: wastewater quantity and quality are associated with landuse:</p> <ol style="list-style-type: none"> 1. Increased urbanization will result in greater wastewater generation as population density increases 	<p>control projects being undertaken an evaluated</p>	<p>data – trends and impact analysis requires both and long term information due to climate effects and natural variation</p> <p>□ Funding</p>

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	<ul style="list-style-type: none"> 2. Nature of constituents (e.g., pollutants) may change: developed lands may have a greater potential for commercial and industrial pollutants 3. Agricultural wastewater may not be adequately treated 4. Increased development may result in more urban wastewater discharge that may dominate stream flows; but, less agricultural drainage <p>I. Water Quality Impacts: changing surface water flow regime and land use management affects watershed water quality in terms of meeting regulatory water quality standards:</p> <ul style="list-style-type: none"> 1. Development (increased population) results in more waste water and associated pollutants 2. Augmentation with lower quality water may reduce tributary water quality 3. Development can increase lawn chemical use and transport to surface water (nutrients and pesticides) 4. Agricultural drainage and runoff can carry nutrients and pesticides to surface water 5. Reduction in riparian vegetation reduces pollutant removal in surface runoff waters 6. Increased turbidity by higher flow and more surface and bank erosion are affected by land use management practices 7. Increased recreational needs and access can contribute to higher turbidity due to bank erosion (unprotected stream crossings) 8. Reduction in riparian vegetation (shade) can contribute to higher water temperature and associated effects on dissolved oxygen, pH, and unionized ammonia 9. Potential for heavy metal impacts due to industrial land use and historical mining <p>J. Other Surface Water Impacts: changing surface water flow regime is affected by changes in land use:</p> <ul style="list-style-type: none"> 1. Developed land can result in augmented and nuisance flows (flows that would not typically occur during the dry season in naturally ephemeral streams) generated by landscape and 		

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	<p>agricultural irrigation</p> <ol style="list-style-type: none"> 2. Canal systems management (withdrawal amount, timing, location) is altered by land use and population requirements 3. Confined aquifer recharge is affected by amount of surface water (the watershed straddles the recharge zone) 4. Soil water storage can be modified by development by changing surface topography (less or more depressions for surface water storage), irrigation and drainage, and changing the vegetative community (uptake). 		
<p>IV. OPEN SPACE MANAGEMENT</p>	<p>A. Management Needs: Open Space areas have been designated for habitat value and aesthetic resources. These areas include current and planned areas; however, without adequate management, these resources are under-utilized and may degrade:</p> <ol style="list-style-type: none"> 1. Many Open Spaces lack adequate Management Plans 2. Lack of enforcement precludes protection 3. Active monitoring by qualified personnel is insufficient 	<ul style="list-style-type: none"> ❑ Some management plans exist and can be used as templates to develop plans for all impacted areas ❑ Federal and State Special Status Species require management and protection considerations 	<ul style="list-style-type: none"> ❑ Lack of signage ❑ Lack of enforcement personnel ❑ Lack of funding to manage and enforce ❑ Insufficient monitoring of health ❑ Inadequate understanding by the public on the importance of Open Space preservation
<p>V. DEVELOPMENT AND GROWTH</p>	<p>B. Population Growth Pressures: population growth creates pressures for development of living space, industry, and quality of life</p> <ol style="list-style-type: none"> 1. Socioeconomic viability of the region relies on development and associated taxing, infrastructure development, and access 2. Increasing populations require living and working areas 3. Suitable land for development depends on soils and topography – these areas are limited; high growth could lead to development on marginal lands 4. Local land use plans govern development; these can be changed and updated if necessary 	<ul style="list-style-type: none"> ❑ Conservation easements ❑ Dry Creek Parkway ❑ Flood control ❑ Protection of farming, ranching, and open space (Placer County Legacy) 	<ul style="list-style-type: none"> ❑ Growth pressures (development) ❑ Lack of public education and support ❑ Many prime areas already modified <p>Funding</p>

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	<p>5. Urbanization of rural areas concentrates populations allowing for larger non-developed areas outside of the urbanized region</p> <p>C. Conversion of Rural and Undeveloped Lands: building and development of these lands can provide more living space and increase the economic base by increasing population density and shifting industries to more profitable types:</p> <ol style="list-style-type: none"> 1. Development of rural and undeveloped lands reduces upland habitat for diverse and special status species 2. Development contributes to loss of habitat diversity and continuity for terrestrial wildlife 3. Reductions in rural and undeveloped land change the hydrology (increasing impervious surfaces, drainage, and irrigation)Development results in loss of aesthetic open space values 	<ul style="list-style-type: none"> ❑ State and Federal Special Status Species protection 	
<p>VI. EDUCATION AND PUBLIC OUTREACH</p>	<p>A. Compliance With Plan Goals: the nature of this plan is non-regulatory; consequently, attainment of the plan goals will be, in a large part, voluntary (unless subsequent regulatory devices are implemented). In some situations, compliance will not occur due to:</p> <ol style="list-style-type: none"> 1. Lack of knowledge and understanding of personal impact 2. Insufficient knowledge about how the system functions (e.g., under-designed flood control) 3. Public acceptance and personal values 4. Lack of understanding that compliance may be a more efficient strategy in the long run (e.g., implementation of water quality Best Management Practices now, may prevent listing of waters for TMDLs development) 	<ul style="list-style-type: none"> ❑ Ongoing education in public schools ❑ Public involvement in pilot and volunteer projects 	<ul style="list-style-type: none"> ❑ Lack of public involvement ❑ Competitive special interest groups ❑ Lack of tools to assist in education