

Appendix B

Hydrology & Stream Report

The Truckee *Downtown Specific Plan* published policies that are echoed in this Downtown River Revitalization Strategy. Both plans call for the improvement in the quality of wildlife and fisheries habitat in the Truckee River and its tributaries. Flood control projects shall maintain and protect the ecological value of waterways. Riparian vegetation along the river should be protected. Programs that encourage sport fishing are also supported. Degraded portions of waterways should be enhanced or restored. A summary of the policies for the Truckee River Corridor as published in the Truckee *Downtown Specific Plan* follow:

- Relocate industrial uses off the river.
- Convert industrial lands adjacent to the Truckee River to residential and commercial uses.
- Establish a park on State-owned property along the south side of the River.
- Establish a bicycle/pedestrian trail along the south side of the River.
- Link the Downtown Commercial Core with the Truckee River.
- Provide suitable access for river recreation.
- Improve views from the River corridor.
- Improve the appearance of the Bridge Street bridge with architectural details and paint.
- Improve the quality of wildlife and fishery habitat in the Truckee River and its tributaries.
- Support a Truckee River Day.
- Protect and improve water quality in the Truckee River and its tributaries.
- Design environmentally sensitive and aesthetically pleasing new pedestrian/ bicycle bridge crossings.
- “Cluster” new residential development along the River.
- New projects adjacent to the River must mitigate any adverse visual impacts.
- Increase the visibility of the River.
- Establish setbacks from the Truckee River in the Zoning Ordinance.
- Maintain and protect ecological value of waterways.
- Protect riparian vegetation along the Truckee River.
- Projects shall not result in an increase in the rate of runoff or erosion.
- Encourage programs which improve sport fishing.
- Coordinate with agencies to establish a restoration program for degraded portions of DSA waterways.

This river revitalization strategy recognizes that the beauty of the river is not in the adjacent development or built environment, but rather in the aesthetic qualities of the natural environment. This Strategy calls for a limited number of recreational improvements to be constructed within or adjacent to the 100-year floodplain of the Truckee River. These include pedestrian bridges and raft/tube landings for a “put in” near the confluence with Donner Creek and a “take out” at the existing river pedestrian bridge off of West River Street. The “put-in”/“take-out” should be located on a natural, stable point bar. These recreational improvements could be mitigated through the construction of two mitigation areas off of West River Street. Before any improvements are constructed adjacent to or within the 100-

year floodplain, a geomorphic assessment of the river should be performed to insure that proposed uses can be tied to the geomorphic form. For any proposed improvements to “fit” or “function”, the overall process geomorphology at the site needs to be assessed. The climate, and the past and present geology and geomorphology form the soils, which combine to form the hydrograph, or runoff patterns, which in turn dictate the form and distribution of the vegetation and habitat types and biota. The design must be based in how these processes function together, carefully integrating the built environment into the physical function of the site. The natural geomorphic form should dictate the location and type of restoration proposed.

A flood control strategy should be adopted by the Town that would not allow impediments to the flood conveyance. The 100-year flood should be allowed to pass freely through the town.

As a part of the flood strategy, we recommend unstable banks of the river be repaired and planted with native riparian vegetation and manmade fill on the west end of West River Drive that was placed in the floodplain after the 1997 flood be removed and the bank restored. All improvements should consider the natural environment and enhance the natural functions of the environment while improving the aesthetic values.

Adjacent to the river, this master strategy recommends that industrial uses located along the Truckee River Corridor be phased out and that new development protects the river. The new development will be designed to not increase the rate of erosion or runoff. However, it is the goal of this Strategy to actually decrease storm hydrographs and runoff over existing conditions. Runoff will be detained or retained in ponds or will utilize infiltration to assist in accomplishing these goals. The entire riverside of each development parcel adjacent to the river or its tributaries will utilize a 25-foot wide bio-filter edge. This bio-filter will be a grass filter strip to accept sheet flow runoff from parking lots and trap pollutants. The 25-foot wide bio-filter edge should be considered a minimum riparian edge. In some areas, a 50-200 foot buffer is required (of which some could be a bio-filter).

The impacts of Storm water on streams fit into four categories. These include stream hydrology, stream morphology, water quality and aquatic ecology. The extent of impact is related to the climate, land use, and the measures implemented to address the impacts.¹

Briefly, the impacts on streams are:

Stream Hydrology:

Urban Development affects the environment through changes in the size and frequency of storm runoff events, changes in base flows of the stream and changes in stream flow velocities during storms results in decrease in travel time for runoff. Peak discharges in a stream can increase from urbanization due to decrease in infiltration of rainfall into the ground, loss of buffering vegetation and resultant reduced evapotranspiration. This results in more surface runoff and larger loads of various pollutant constituents found in storm water.

Stream Morphology:

When the hydrology of the stream changes, it results in changes to the physical characteristic of the stream. Such changes include streambed degradation,

stream widening, and stream bank erosion. As the stream profile degrades and the stream tries to widen to accommodate higher flows, in stream bank erosions increase along with increases in sediment loads. These changes in the streambed also result in change to the habitat of aquatic life.

Stream Quality:

Water quality is impacted through urbanization as a result of erosion during construction, changes in stream morphology, and washing off of accumulated deposits on the urban landscape. Water quality problems include turbid water, nutrient enrichment, bacterial contamination, organic matter loads, metals, salts, temperature increases and increased trash and debris.

Developers are encouraged in this river revitalization to use porous pavement in parking lots and in snow storage areas. Detention is recommended in landscaping areas and shall be designed to also function as infiltration and sedimentation basins. Impervious areas shall not be directly connected to the floodplain. Best Management Practices (BMP's) shall be utilized during construction and in the design of all new development to improve storm water runoff quality.

BMP's used in the development include grass filter buffer strips, grass drainage swales, porous pavement, landscape detention, retention and infiltration basins, constructed wetlands and others.

Construction BMP's mitigate the increased soil erosion and subsequent deposition of sediment off site during the period of construction from the start of earth disturbance until final landscaping and storm water quality measures are effectively in place. Many references detail these measures.

As a supplement to the above measures for new development, this master plan recommends that sand be cleaned up between snowstorms. Areas within the river corridor that will not be redeveloped should be analyzed and existing untreated storm water runoff should be retrofitted with BMP's.

A. Regulatory Base

FEMA

The Federal Insurance and Mitigation Administration (FIMA), a component of the Federal Emergency Management Agency (FEMA), manages the National Flood Insurance Program (NFIP) which oversees the floodplain management and mapping components of the Program. Communities participating in the NFIP are provided with a Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS).

FEMA stipulates minimum guidelines to regulate floodplain development including the following:

- No development within the 100-year floodplain may result in a rise in the base flood elevation (BFE).
- No encroachment within the floodway resulting in a water surface rise in excess of one foot.

A. Regulatory Base

Corps of Engineers

Under Section 404 of the Clean Water Act projects must obtain a permit from the US Army Corps of Engineers prior to discharge of dredged or fill material into waters of the United States, including wetlands. **The purpose of the Section 404 program is to insure that the water quality is protected from discharges of dredged or fill material that could permanently alter or destroy these valuable resources.**

If a project involves discharge of dredged or fill material, it will be necessary for the Corps to evaluate the proposed activity under the Section 404(b) (1) guidelines prepared by the Environmental Protection Agency. The guidelines restrict discharges into aquatic areas where less environmentally damaging, practicable alternatives exist.

Wetlands are areas that are inundated or saturated by surface or groundwater with such frequency and duration so as to support vegetation typically found in saturated soil conditions. Wetlands serve important functions relating to fish and wildlife, as well as protection of other areas from erosion; storage areas for storm and floodwaters; and recharge areas where surface and ground water connect.

Lahontan Regional Water Quality Control Board

The Lahontan Regional Water Quality Control Board has targeted five watersheds including the Truckee and Upper Truckee watersheds as highest priority watersheds. The watersheds are selected based on their resource value, known water quality problems and opportunities for implementing Regional Water Quality Control Board programs.

The Regional Board's guidelines for projects are more stringent than FEMA's and prohibit any new development within the floodplain. However, the Regional Board may grant exemptions under the following categories for new projects:

- Projects intended to reduce or mitigate sources of erosion or water pollution or restore previously disturbed floodplain areas.
- Essential transportation facilities.
- Projects necessary to protect public health.
- Projects necessary for public recreation.
- Projects for outdoor public recreation within portions of the 100-year floodplain which have been altered prior to June 26, 1976.

Prior to granting an exemption the Regional Board must find that the project incorporates all of the following:

- Project included in at least one of above categories valid for exemption.
- No reasonable alternative to locating the project within the 100-year floodplain.
- The project by its nature must be located within the floodplain.
- The project includes necessary mitigation for erosion and surface runoff problems caused by the project.
- The project will not reduce the flood flow attenuation capacity, the surface flow treatment capacity, or the ground water treatment flow capacity from existing conditions.

Truckee River Watershed Council

The Truckee River Watershed Council (TRWC), although not a regulatory agency, was founded to develop watershed assessment and use it to improve management and planning for the watershed. The mission of the TRWC focuses on water quality and riparian and aquatic life. The TRWC's areas of focus include maintaining or improving the health of riparian and aquatic habitat; and decreasing sedimentation in the watershed. Projects involving water quality and river restoration are of particular interest to the TRWC.

B. River Improvements

Some additional information on the proposed river improvements follows:

- Trails should be designed to meet ADA regulations and American Association of State Highway and Transportation Officials (AASHTO) geometric design guidelines as appropriate.
- Pedestrian Bridges should preferably span the 100-year floodplain and should be 200 to 300 feet in length and 10 to 12 feet wide.
- Raft/Tube “put ins” and “take outs” should be located on a natural stable point bar.
- General Habitat Restoration along the river corridor – The floodplain should be typically vegetated by three zones: a riparian edge, an under story and an over story. Areas lacking these zones could be planted with native vegetation such as willow, dogwood, sedges, grasses, quaking aspen and cottonwood. The vegetation should be functioning habitat and plant communities and these functions should be studied before new vegetation is planted.
- Habitat Restoration Area – A portion of the study area has been designated for habitat restoration. As stated earlier, a geomorphic analysis of the river and an analysis of the function of the habitat and plant communities should be performed, before any habitat restoration is constructed. At this time, we believe the area between East River Street and the Truckee River should be excavated and planted with native vegetation creating a wetland riparian edge and terrestrial habitat area planted with willow, dogwood, sedges, grasses, quaking aspen and cottonwood.
- The bank of the river adjacent to West River Street was severely eroded during the 1997 flood and was subsequently stabilized. After the appropriate studies are undertaken, this reach of river could be enhanced by stepping the bank back utilizing concrete or boulder retaining walls. The benches created could be used for planting or a depressed trail with scenic overlooks. Ideally, the road would be realigned to the north into railroad right-of-way, to provide room for these improvements. However, we believe the planting areas should be developed whether the road can be realigned or not.
- Bio-filter Edge – They are uniformly graded and densely vegetated areas of turf grass, shrubs and trees. They require sheet flow to promote filtration, infiltration and settling to reduce runoff pollutants. They can be used to remove larger sediment from runoff off impervious areas. Infiltration areas can be provided within this edge. Whenever concentrated runoff occurs, it should be evenly distributed across the width of the buffer via a flow spreader. This may be a porous pavement strip or another type of structure to achieve uniform sheet-flow conditions.

A. Regulatory Base...

B. River Improvements...

These edges are typically located adjacent to impervious areas. When used, they should be incorporated into site drainage, street drainage and master drainage planning. Because their effectiveness depends on having an evenly distribute sheet flow over their surface, the size of the contributing area, and the associated volume of the runoff have to be limited. Flow can be directly accepted from an impervious area such as from a parking lot and building roofs, provided the flow is distributed uniformly over the strip. They help reduce some of the runoff volume from small storms and are more effective when combined with infiltration areas.

The grass and other vegetation provide aesthetically pleasing green space, which can be incorporated into a development landscaping plan. In addition, their used adds little cost to a development that has to provide open space, and their maintenance should be no different than routine maintenance of the site's landscaping. Eventually, the grass strip next to the spreader or the pavement will have accumulated sufficient sediment to block runoff. At that point in time, a portion of the strip will need to be removed and replaced.

Grass and trees within these buffer strips can provide wildlife habitat and help reduce runoff through infiltration.

Pollutant removal depends on many factors such as soil permeability, site slope, the flow path length along the buffer, the characteristics of drainage area, runoff volumes and velocities, and the type of vegetation. The general pollutant removal of both particulate and soluble pollutants is projected to be low to moderate. These edges rely primarily upon the settling and interception of solids, and to only a minor degree, on biological uptake and runoff infiltration.