Tualatin Basin

Effective Impervious Area Reduction

Task Force Report

Clean Water Services

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Acknowledgements

Clean Water Services appreciates the time and commitment of the EIA Task Force members including:

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Introduction

The Healthy Streams Plan is a coordinated response to the Clean Water Act (CWA) and Endangered Species Act (ESA) within the urban portions of the Tualatin Basin. Clean Water Services (CWS), local cities, Washington County, Metro, and Tualatin Hills Park and Recreation District, are all partners in the Healthy Streams Plan development and implementation. The Healthy Streams Plan contains the following key elements:

- Inventory of the stream location and condition (Watersheds 2000),
- Public habits and values analysis
- Economic analysis
- Policy and programmatic focus areas (effective impervious area reduction, vegetated corridors, hydrology/hydraulics, and operations and maintenance).

For the Policy and Programmatic Focus Areas, multidisciplinary task forces are asked to evaluate management options that may improve resource conditions over time. The purpose of this report is to identify and succinctly describe potential management actions for reducing effective impervious area (EIA). This report documents the work of the EIA Task Force and their recommendations.

A follow-up implementation strategy to this EIA Task Force Report will be developed with the local jurisdictions, as we collectively determine the most appropriate means to address the recommendations of the EIA Task Force. The implementation strategy will remain a work in progress as the actions are further refined and discussed through the implementation process.

Regulatory Context

Clean Water Act. For more than 30 years, CWS has provided treatment of sewerage to protect in stream water quality of the Tualatin River. For the last twelve years, CWS and partner cities have implemented a Surface Water Management Program (SWM) throughout the urban watersheds, in order to meet the water quality requirements of the Clean Water Act as outlined in the Total Maximum Daily Load (TMDL) Program and the National Pollutant Discharge Elimination System (NPDES) Stormwater Permit Program.

Based on the water quality data collected over the last 10 years, it is clear that the SWM program has reduce nutrients and improved the quality of the surface waters in the urban watersheds, despite rapid and intense development activities. However, the recent stream inventories conducted in 2000 and monitoring of stream temperature, sediment, and flow, indicate enhancement of the physical and biological functions of the stream corridors is still needed to further improve water quality and promote a healthy stream system.

The Clean Water Act requires the maintenance of all the beneficial uses of the water resources. For the streams and River in the Tualatin Basin, those uses include: aquatic life and resident fish, water contact recreation, aesthetics, salmonid spawning and rearing, water supply, drinking water and livestock watering. Maintaining the physical and biological

functions of the streams, as well as protecting water quality, will help achieve the beneficial uses.

Endangered Species Act. Developing a strategy to comply with the requirements of ESA began with the listing of winter Steelhead and spring Chinook as threatened within the upper Willamette Evolutionarily Significant Unit (ESU) in March of 1999. In general, the ESA requires that "take" of the listed species is avoided and conservation is promoted. The National Marine Fisheries Service (NMFS) outlined the activities that may result in a take, and developed lists of actions that could reduce the risk of take. These actions came in the form of the 4(d) rule.

Healthy Streams Plan partners responded to the listing by developing and funding a comprehensive watershed planning process that would refine management actions needed under the CWA, as well as identify new actions that would support the goal of conservation of the species under the ESA. The planning process calls for collecting and integrating all the information necessary to develop an integrated CWA and ESA response plan. However, because many aspects of the ESA are controversial and currently in legal negotiations, the form of the response plan for the ESA (either a habitat conservation plan, a voluntary take avoidance plan, or a 4(d) rule take limitation) has not been determined.

Watershed Context

Achieving the goals set forth in the CWA and ESA requires a watershed perspective. The four principle elements important to stream and wetland health are water (watershed hydrologic cycle), soils, vegetation, and biota. Each element is briefly discussed below.

Water and the Hydrologic Cycle. In a simplified undisturbed hydrological cycle (figure 1), precipitation falls from the sky, gets intercepted by vegetation, infiltrates into the rich duff layers of forests and prairies, recharges groundwater, and emerges in local streams and wetlands as baseflow.

With the loss of vegetation and disturbance of forest and prairie soils, precipitation is still infiltrated, but at a much lesser rate. Ground water still recharges the streams and wetlands, but the retention time in the vegetation / topsoil sponge is less. Deep ground water recharge may be affected and there are greater levels of surface water runoff. With each incremental impact to the vegetation and soil structure, there are changes to the infiltration / runoff relationship. (Figure 2) Depending on the size and character of the watershed, vegetation loss, soils alteration, and/or tile draining can result in runoff levels similar to that of an urbanized residential area.

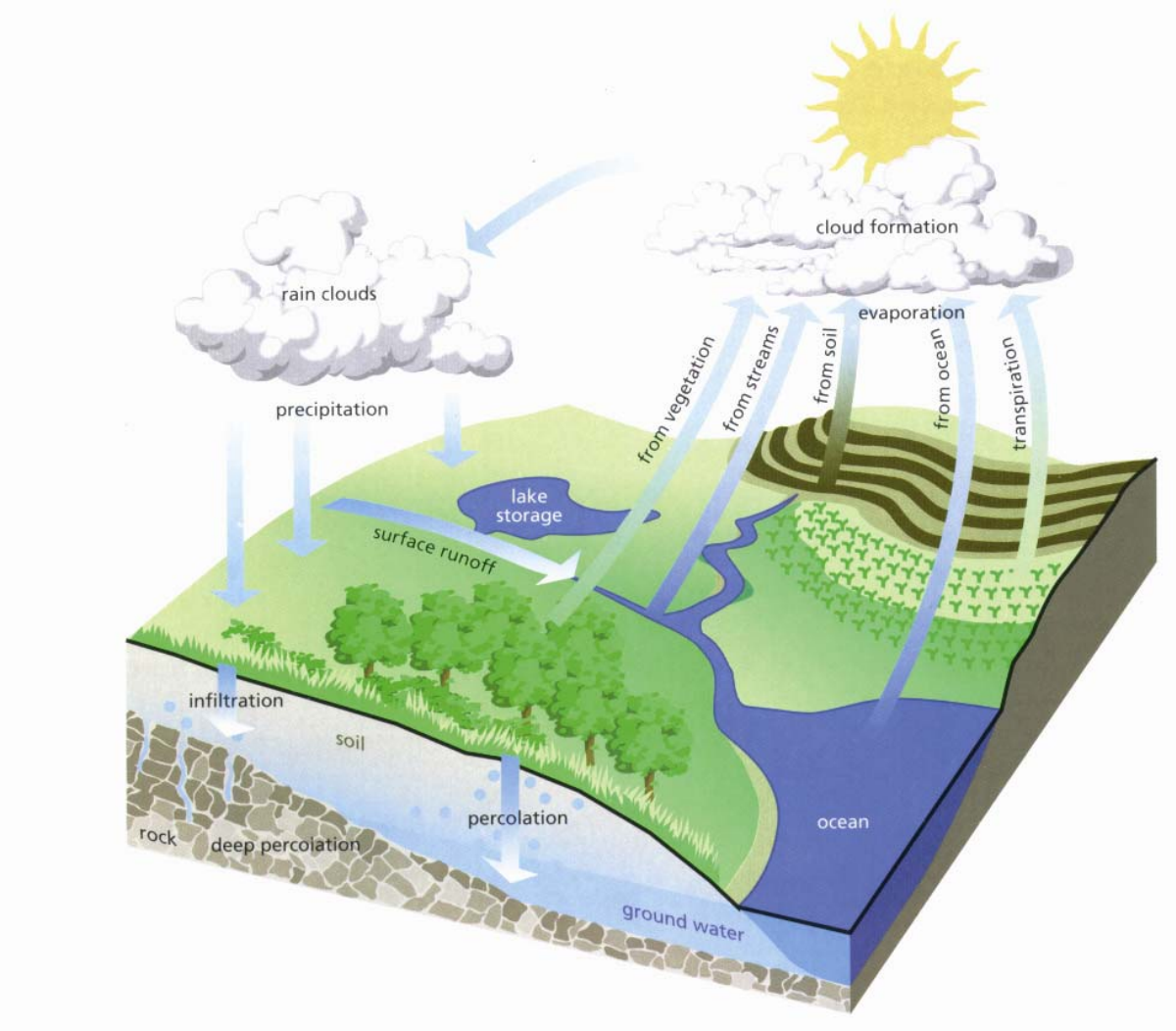

Figure 1: The Hydrologic Cycle. The transfer of water from precipitation to surface water and groundwater, to storage and runoff, and eventually back to the atmosphere is an ongoing cycle.

When the landscape becomes urbanized, impervious surface and storm water drain lines are added. The "hardscape" circumvents the typical hydrologic cycles presented in Figure 1. The loss of topsoil retention time and groundwater recharge results in less base flow in the streams. An increase in the frequency and volume of runoff, can damage the physical structure of stream channels and alter wetland hydroperiods. Storm events that were once absorbed by the landscape become "flashy" flows, rapidly rising and falling surface waters that correlate with passing storms.

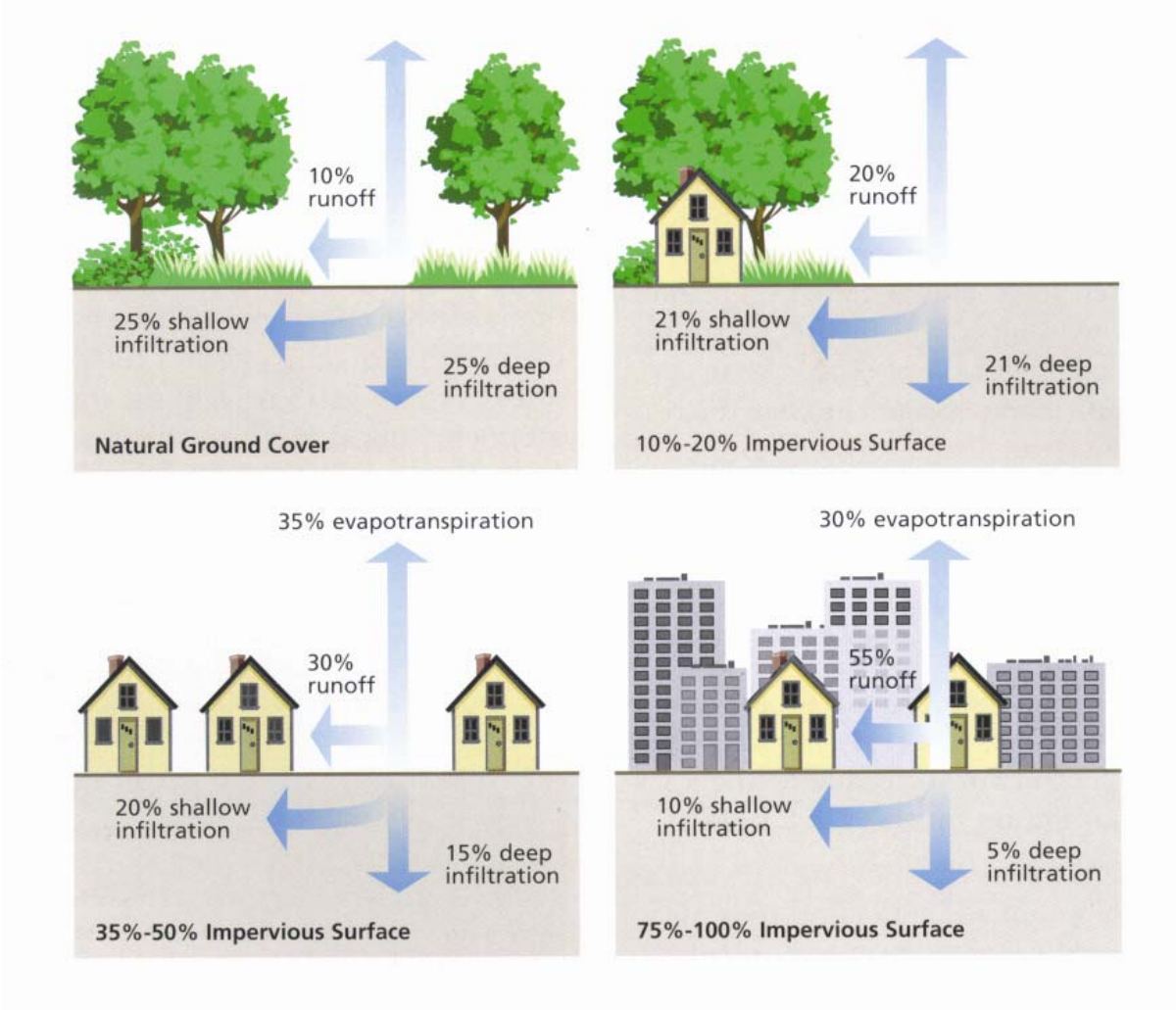

Figure 2: Altered Hydrologic Cycle. As the land use is changed, from forest to farm to urban landscape, the hydrologic cycle is impacted.

Rainfall distribution records in the Portland Metro area indicate that about 90% of all storms have a rainfall volume of less than 0.5 inches in a 24-hour period. Precipitation volumes and timing of storm events play a key role in the amount of infiltration and runoff generated (see soils discussion).

To protect or enhance stream / wetland health, the hydrologic cycle must function in a manner that is consistent with the needs of the stream / wetland base and storm flows. Stream health is impaired when the flow regimes alter the geomorphic functions (bed load movement, large wood retention, scour / deposition processes) of a stream as well as the ability of the riparian corridor to regenerate itself. While larger infrequent flood events do alter streams and wetlands, the focus of EIA reduction is on the small storm hydrology of the watershed. The smaller but more frequent, day to day hydrologic impacts on the stream / wetland can have detrimental impacts to biota and vegetation.

Soils. The type of soils in a watershed plays a significant role in the rates of infiltration, recharge, and runoff, as well as influencing water chemistry. In the Tualatin Basin, a majority of the soil is classified as silt loam with permeability ratings of 0.6-2.0 inches per hour in the first 12 inches on average (SCS Soil Survey of Washington County, 1982). For a majority of the storms that occur in the Tualatin Basin, the native undisturbed soil infiltration rate is adequate for the 0.5 inch per 24-hour storm event. Saturation and ponding typically occurs when rainfall amounts are greater than a half an inch in a 24 hour period or when there are successive storms with high volumes of rain. This represents about 10 % of the storms in any given year. Compaction of soil, lack of topsoil, loss of soil aerating organisms, and vegetation removal all affect soil infiltration.

Vegetation. There is a diversity of vegetation within the Tualatin Basin, including forests field / crop, and urban landscaping. The more complex the vegetative community structure, the higher the level of interception. If soil duff is allowed to accumulate, it also acts as a sponge to soak up waters. Providing complex vegetative structure improves interception and infiltration in a watershed.

Biota. Mammals such as moles, voles, mice, worms and other soil dwelling organisms regularly aerate the soil, which facilitates greater soil infiltration. Beavers, muskrat, and other water dwelling mammals influence the flow of water in streams and wetlands. Dams trigger overbank flooding of the floodplains, which recharges shallow near-stream ground water. When these species are not present on the land or in the water, the hydrologic is affected.

Understanding Effective Impervious Area

What is effective impervious area?

Impervious area such as rooftops, streets, sidewalks, and parking areas do not allow water to drain into the soil. Impervious area that collects and drains the water directly to a stream or wetland system via pipes or sheet flow is considered "effective impervious area", because it effectively drains the landscape. Impervious area that drains to landscaping, swales, parks and other impervious areas is considered "ineffective" because the water is allowed to infiltrate through the soil and into ground water, without a direct connection to the stream or wetland.

Why are we looking at effective impervious area as a stormwater management tool?

We are looking at EIA in the urban area because we know that impervious surfaces interrupt the hydrologic cycle (see figure 3). The focus of EIA reduction is on the impacts of smaller storms, which before urbanization, generated little runoff. With urbanization, runoff is more frequent and impacts stream channel conditions and the wetland hydroperiod.

Research conducted by the University of Washington and the Center for Watershed Protection indicates that the biological productivity of streams declines significantly once effective impervious area reaches 10-20% in a subwatershed (Importance of Imperviousness, Appendix 2). In conducting watershed hydrologic models for each watershed in the Healthy Streams study area, the level of EIA was determined (Map 1). There were few subwatersheds inside the urban growth boundary with less than 20% EIA. However, there are still many in the 30-40% EIA range that have the potential for retrofit that could bring the EIA down. In urban fringe areas, preventing high levels of EIA could reduce potential stream impacts.

While typical stormwater pretreatment and detention facility designs have helped to improve stormwater quality and reduce large storm flooding, they have not been specifically designed to manage small storm flow impacts. A combined approach of reducing effective impervious area, reforestation of open space uplands, protection of riparian corridors, and strategically placed "facilities" could result in greater improvements to stream health, than any one or two strategies alone.

How is effective impervious area reduced?

Reducing effective impervious area is defined as disconnecting impervious surfaces such as sidewalks, rooftops, parking areas, and streets, from the drainage system so that runoff does not flow directly to streams. Disconnecting the stormwater system allows the watersheds' hydrologic cycle to respond in a manner that more closely reflects pre-disturbed conditions (though it does not restore such condition). EIA reduction can occur as part of new development, redevelopment, or be part of a retrofit design. The level of benefit is determined by how well the practices minimize runoff in small to mid size storm events.

Will effective impervious area reduction make a difference?

The hydrologic function of a watershed affects stream health. Many activities on the landscape affect the hydrologic cycle in terms of timing, volume, and distribution of waters. Forestry activities, agricultural practices, and urbanization all impact the hydrologic cycle of

a watershed, and consequently stream health. The relative level of impact of each land use (forestry, agriculture and urban) is difficult to quantify. Factors such as soils, slope, vegetation types, pipe size and distribution, and management practices all play a role in hydrologic impact.

With 18% of the Tualatin Basin in urban land use (127 sq miles), impervious cover is an important landscape element of the watershed. Reducing EIA will not restore hydrologic function to pre-development levels. However, improvements to base flows and less frequent bankfull events will enhance stream functions.

Measuring the effectiveness of EIA reduction as a management tool will be equally as difficult as measuring our other stormwater management tools. However, monitoring of pilot projects to serve as surrogates can provide some information. In-stream flow monitoring established on a majority of the urban tributaries, should be able to help us determine over time if base flows are improving and bankfull flows are decreasing in frequency. Repeat sampling of stream conditions over time, as EIA reduction is implemented, could also be helpful in gauging effectiveness.

Are Other Watershed Managers Looking at EIA Reduction?

Stormwater managers around the country recognize EIA reduction as a key element of addressing many complex stormwater runoff issues (See "The Importance of Imperviousness" and "Effects of Urbanization on Small Streams in the Puget Sound Ecoregion" articles in Appendix 2). It is a tool that has begun to be implemented in Washington State and British Columbia, as well as at progressive development projects around the country (See NEMO, City of Lacey, Appendix 2)

There are a number of ongoing efforts that are closely related to the work of this Task Force and reinforce its recommendations. At a national level, the Center for Watershed Protection has led efforts to reduce effective impervious cover. Regionally, the University of Washington has furthered the research on the impact of effective impervious cover. The State of Washington and its counties and cities have begun implementing low impact development standards.

Closer to Portland, the Green Streets program conducted by METRO is a multi-agency effort to address improved connectivity, reducing effective impervious area and using the street rights-of-way for opportunities to clean, store, and infiltrate stormwater. Many of the recommendations in the Green Streets design guidance complement the recommendations of the Task Force. The City of Portland has also implemented impervious cover reduction strategies into their stormwater design manual.

Task Force Process

Clean Water Services convened a Task Force to explore opportunities to reduce effective impervious areas. The Task Force's role was to:

- review the existing literature on the topic from around the country
- define goals and objectives for the proposed policy adjustment
- identify a set of actions appropriate for the Tualatin Basin that would address effective impervious area reduction, and
- work to secure the commitment of people responsible for implementing the actions.

Goals and Objectives

The goals and objectives developed by the Task Force for this effective impervious area reduction process were to:

- Foster watershed development practices that:
  - Incorporate the natural drainage and infiltration patterns of the area
  - Improve water quality
  - Protect and enhance significant habitat features
- Foster community development practices that:
  - Protect streams from urban stormwater runoff
  - Integrate stormwater treatment and retention facilities into the open space amenities of a community
  - Allow cluster design
  - Protect and enhance neighborhood livability
- Foster site development practices, for both new and redeveloped sites, that:
  - Minimize the negative effects of impervious surfaces with generous landscape standards that provide infiltration opportunities
  - Protect mature trees, native vegetation infiltration opportunities
  - Minimize soil compaction in landscaped areas
  - Allow for innovative management of rooftop runoff

The Task Force also identified individual critical success factors, which each member used as a basis for their own decision making regarding which EIA actions were appropriate to consider. Their success factors included:

- Develop a clear overall strategy that links to the program goals, the problems the task force is addressing and defining quantifiable metrics that measure performance before getting started.
- Product to give to developers to reduce impervious surfaces
- Realistic and measurable; will it do any good?
- Successfully mitigate runoff without compromising emergency access
- Changes to development codes
- Early actions, not earth-shattering, justifiable, consistent
- Agreement of group

- Specific detailed approaches that are realistic and implementable given regulatory, fiscal, market and environmental factors
- Emergency access and safe housing development
- Result must be doable and show how it improves or restricts declining situation
- Functional procedures
- Participants satisfied with process. Develop clear direction. Project is on time and on budget.
- Rules and regulations that can be enacted. Enunciate a clear motive for doing this, i.e. drinking water, restore fish habitat, cause no harm
- Effective and realistic, supportable by stakeholder groups

Technical Analysis

Technical questions regarding the feasibility and effectiveness of the possible actions were explored, using information gathered during Watersheds 2000. The mapping and modeling used to address the technical questions, is briefly discussed below.

Mapping EIA. Map 1 shows the EIA by subwatershed delineation for the Tualatin Basin (For EIA delineation methods see Appendix 1). The green zones show the subbasins with lower levels of EIA; the yellow zones are moderate EIA, and the orange/red zones have high EIA. As previously discussed, the higher the EIA, the greater the impact to the hydrologic function of the subwatershed. Map 2 shows the affect of 2040 planned development on EIA in the watershed.

Reducing EIA in any subwatershed will likely improve hydrologic function. However, prevention of additional EIA in the green and yellow zones and reduction in the yellow and orange zones are likely to be primary focus areas. The EIA map and Watersheds 2000 stream data will be used to further document where it is most appropriate and effective to implement the Task Force's proposed actions.

Modeling Effectiveness. In addition to mapping EIA, a continuous hydrologic model was used on Bronson Creek to show the relative effectiveness of implementing different levels of impervious area reductions. The goal of the modeling analysis was to demonstrate the level of hydrologic impact EIA has on a local watershed. To evaluate the impact of residential homes, a simple spreadsheet was developed to demonstrate the amount of runoff generated by rooftops. The spreadsheet computes the gallons of water that could be collected from the roof once the user inputs their house footprint. The modeling analysis and rooftop spreadsheet are provided in Appendix 1.

Following the review of the technical information provided, the Task Force developed and refined the potential action list to include the ones they agreed were feasible, effective and implementable in the short term. This report outlines the result of the effort and is the starting point for refinement of codes and programs that will ultimately result in improved stormwater management by reducing effective impervious area.

Map 1

Map 2

Recommendations

The Task Force identified by consensus the actions in Table 1 to reduce effective impervious area as "clearly feasible and beneficial" for watershed hydrology and/or water quality. The intent was to select actions that are "likely to be implemented" and to "establish momentum" (a basis for action), rather than selecting actions that might be resisted and therefore unlikely to be implemented. The actions are grouped by major category. The actions the Task Force did not fully agree upon are included in the full list of potential actions provided in Appendix 3.

Next Steps

Following the completion of this Task Force Report, Healthy Stream partners will be asked to review the actions and determine an appropriate course for implementation. An implementation strategy will be developed as the Healthy Streams partners move to refine the actions and adjust their local codes and ordinances. Implementation of voluntary guidance and/or mandatory standards is expected to take up to three years. There are efforts underway with Audubon Society of Portland and with the Oregon Community Foundation to examine current regulations and make suggestions for code revisions to encourage EIA reduction strategies.

Commitment of the Healthy Stream partners to completing such language adjustments and incentive programs will affect the timing and completion of the Healthy Streams Plan. The EIA Reduction is key policy and programmatic focus area under the Healthy Streams Plan, scheduled to be in draft form in the Fall of 2002.

Conclusion

The recommendations for reducing effective impervious area can benefit water quality, quantity management, and stream habitat conditions. However, the level of benefit will depend in large part on the existing watershed and riparian area conditions. Implementing the outlined recommendations will be easier and more effective in areas with low EIA. Retrofitting more developed areas will present greater challenges and require a stronger commitment from individual property owners.

To be effective, solutions must address the issue at the watershed, community and site specific levels. At the watershed level, protecting the most diverse, healthy and functioning landscapes and enhancing degraded streams in low density areas should be a priority. At the community level, new developments should implement innovative techniques to reduce runoff and maximize the function of the riparian corridors. Older developments should retrofit by amending soils in landscaping and significantly increasing tree cover in yards and open spaces. At the site-specific scale, individuals could incorporate features to infiltrate or re-use rainfall. Near stream owners using captured rainwater could help augment flow by irrigating near stream. The cumulative result of effective impervious cover reduction may take years to realize and will rely upon a multi-layered commitment of watershed stakeholders to achieve the goal of sustaining a healthy stream system.

Table 1: Recommended Items, Actions and Responsibilities for EIA Reduction

Development / Construction

Item	Actions	Whose Responsibility
Commercial and multi-family residential green roofs (requires engineered structure)	Allow green roofs to serve as an EIA reduction option. Discount the system development charge for area disconnected	CWS Design and Construction Standards amendment. City / County: Building code? amendment
Compost and soil amendments (top soil, mulch, etc) in the landscaping of all commercial and residential areas that disturb the soil	Require 1-foot depth of compost / topsoil treatment in landscaping. Encourage landscape grading to be concave to allow sheet flow of runoff from impervious areas	City / County land use planners/ building inspector to approve as a component of the landscape requirement of a development permit. Need enforcement mechanism.. Training in roads dept for contracts.
Subsoil treatment and soil drainage	Require 1 foot depth of decompaction of subsoil in landscape areas prior to top soil / compost amendment (see above)	City / County land use planners/ building inspector to approve as a component of the landscape requirement of a development permit. Need enforcement mechanism.. Training in roads dept for contracts.
Subsoil treatment and soil drainage	Require 1 foot of decompaction and 1 foot of compost/topsoil treatment in treatment and detention facilities. Add rock to increase infiltration of subsoil zone if necessary	CWS or City; Design and Construction Standards amendment
Cisterns, rain barrels, infiltration galleries	Allow cisterns, rainbarrels to serve as an EIA reduction option. Discount system development charge for area disconnected. Generate map showing where such an option is appropriate.	CWS; Design and Construction Standards amendment.
Cisterns, rain barrels, infiltration galleries	Provide information to plan reviewers and plumbing officials that a cistern, rainbarrel or infiltration gallery is an "approved" drainage facility	CWS
Cisterns, rain barrels, infiltration galleries	Provide coupons for cisterns, rainbarrels at reduced cost as an incentive to install	CWS

Transportation / Rights of Way

Item	Actions	Whose Responsibility
Permeable sidewalk surfaces	Amend land use /building code to allow permeable surfaces. Require that underlying materials are permeable (gravel layer)	Land use planners / building code officials, City and County engineers
Permeable sidewalk surfaces	Allow alternative (permeable) sidewalk surfaces as an EIA reduction option. Discount SDC for area disconnected.	CWS; Design and Construction Standards amendment.
Sidewalk pitch	Amend building / land use code to require, where ever possible, sidewalk runoff to drain to pervious areas such as planter strips, rock gardens etc. covered by a swm easement, not the streets.	Land use planners / building code officials
Sidewalk pitch	Allow sidewalk pitch to pervious areas as an EIA reduction option. Discount SDC for area disconnected	CWS; Design and Construction Standards amendment.
Shared parking	Encourage shared parking in new developments, require connectivity to decrease EIA. Review and amend as necessary, land use codes associated with parking requirements.	Land use planners
Structure parking	Encourage underground and or in-slope parking where water table and slope stability are not an issue	Land use planners
Min / Max parking standards	Eliminate minimum parking requirements. Increase land use fees and SWM fees for conventional parking. Reduce fees for shared, underground, and parking garages. Investigate tax break for parking garage construction	Metro / City / County officials / CWS
Permeable surfaces / parking and low traffic areas	Allow alternative (permeable) parking and traffic areas as an EIA reduction option. Discount SDC for area disconnected	CWS; Design and Construction Standards amendment.

	Transportation / Rights of Way (continued)	
Permeable surfaces / parking and low traffic areas	Amend land use / building code to allow permeable surfaces in parking and low traffic areas	Land use planners
Storm water retention / storage.	Allow under parking area retention / storage as an EIA reduction option. Discount SDC for area disconnected / stored.	CWS; Design and Construction Standards amendment.
Non-pipe conveyance	Allow drainage with no pipes, allow ditches and swales where feasible. Allow as an EIA reduction option.	CWS; Design and Construction Standards amendment.
Non-pipe conveyance	Allow street standards to have no pipes and catchments	City engineers; CWS
Parking lot landscaping	Require landscaped areas in parking lots to provide treatment, retention and/or infiltration. Provide for a waiver for high intensity land uses (gas stations, convenience stores, areas with high pollutant loading / contamination risk) and redevelopment.	CWS; Design and Construction Standards amendment.
Curb reduction	Reduce curb requirements where adequate drainage conveyance, treatment and storage are available. Amend land use / building code to allow use of no curb, curb cuts, and/or stop blocks in parking areas and residential streets with low traffic and speeds.	Land use planners / building code officials

EIA Tracking and Enforcement

EIA Facility Monitoring and Enforcement	Keep and provide record of acceptable EIA reduction practices (update list as new practices are approved for individual developments) Prepare an intake and monitoring form for EIA projects. Link to GIS database. Require it be completed before final inspection approval.	CWS; Design and Construction Standards amendment.

Hydrology / Stormwater Management

Item	Actions	Whose Responsibility
Acquisition of EIA Easements	Review and revise policies regarding acquisition to allow full range of options to protect hydrologic functions Acquire easements or title in critical hydrologic areas (using SWM fees)	CWS
Prioritize EIA strategies	Prioritize areas with good fish habitat and water quality for preservation and EIA limitations. Require implementation of EIA BMP's to reduce impact in these subwatersheds	CWS
Urban forestry program inside and outside UGB	Cities and County explore implementation of an urban forestry program (see Portland model). Utilize SWM fees and tree cutting replacement fees to fund program.	Cities/ County
Native plant landscaping	Amend land use codes to require a minimum of 60% coverage of native species in public open spaces (less lawn). Such as parks, landscape strips, easements. Exempt ball fields.	Land use planners
Native plant retention	Allow native plant retention as an EIA reduction option, beyond the requirements of the vegetated corridor standards.	CWS; Design and Construction Standards amendment.

Water quality facility placement	Allow water quality facilities in degraded buffers as long as properly functioning conditions are maintained. Allow for step-pool type drainage creation on steep sites. Provide slope standards to prevent slope failure.	CWS; Design and Construction Standards amendment.

Incentive Programs

Item	Actions	Whose Responsibility
SWM fee reduction	Amend SWM fee structure to encourage discharge reduction. Increase SWM SDC and monthly fees, to allow for fee reduction by implementing EIA techniques. Calculate SWM charges based on actual impervious cover connected to the system.	CWS
Expedited reviews	Develop a green tag program that allows for expedited reviews on developments that implement EIA reduction and other green building techniques	CWS / Land Use Planners
Reduced cost soil amendments	Provide coupons or grants to parties willing to retrofit their landscaping to meet the 1-foot topsoil requirement. Set up account with local supplier. Re-evaluate bio-solids, partner with yard waste METRO, DEQ. If appropriate, request disconnection of stormwater on site.	CWS
Grants for eco-designs	Work with cities / county to establish an office of sustainability similar to Portland to manage west side conservation design	CWS in partnership with cities /, county/ Metro
Fee Option for Soil Amendment / Revegetation	Allow development applicants to pay a fee and opt out of the revegetation of vegetated corridors and water quality facilities. CWS to hire contractor to provide landscape service to promote consistency in application of rules.	CWS; Design and Construction Standards amendment.

Incentive Programs (Continued)

Re-use of septic drain fields for stormwater discharges	Allow the reuse of functioning septic tank drain fields as an EIA reduction option. Add to plumbing code as an acceptable disposal option. Educate plan reviewers and inspectors	CWS; Design and Construction Standards amendment. Plumbing code officials
Tax break for stream buffers	Work with State legislature to provide tax incentives to those who maintain vegetated corridors in very good condition.	County / CWS; model BES ODFW program

Actions Recommended and Already Underway

Stormwater pretreatment	Require pretreatment for all transportation projects	CWS / Cities
Public transportation	Encourage use of public transportation. Provide education materials, and incentives to utilize mass transit.	Land use and transportation planners
Retention / detention facilities	Retrofit existing retention and detention facilities for EIA reduction and open space.	CWS
Free vegetation for facilities and vegetated corridors	Provide free vegetation and grants for citizens and community groups interested in revegetation with native plants	CWS