

ORDINANCE NO. 1193

CITY OF LACEY

AN ORDINANCE OF THE CITY OF LACEY, WASHINGTON, ADOPTING ADDITIONAL AMENDMENTS TO THE ENVIRONMENTAL PROTECTION AND RESOURCE CONSERVATION PORTION OF THE CITY'S COMPREHENSIVE PLAN AND APPROVING A SUMMARY FOR PUBLICATION.

WHEREAS, the City Council previously adopted the Lacey Comprehensive Plan containing those elements described in Section 16.03.015 of the Lacey Municipal Code (LMC), and

WHEREAS, during the calendar year 2002, the City Planning Commission considered amendments to that portion of the Comprehensive Plan designated as Environmental Protection and Resource Conservation Plan for the City of Lacey, and

WHEREAS, after public meetings and hearings held with effective notice and after providing opportunity for open discussion, communication and assimilation of adequate information and an opportunity to consider the environmental and economic impacts and consequences which would flow from adoption of the amendments, such amendments and redesignations have been recommended for adoption by the City Council and the Council having previously approved the amendments to the wetlands portion of said plan; NOW, THEREFORE

BE IT ORDAINED by the City Council of the City of Lacey, Washington, as follows:

Section 1. The text amendments to those portions of the Environmental Protection and Resource Conservation Plan relating to fish and wildlife habitat conservation areas (Exhibit A), geologically sensitive areas (Exhibit B) and aquifer protection areas (Exhibit C) as said exhibits are attached hereto and made a part hereof, are hereby adopted as amendments to the Environmental Protection and Resource Conservation Plan.


Section 2. The Summary attached hereto is hereby approved for publication.

PASSED BY THE CITY COUNCIL OF THE CITY OF LACEY,  
WASHINGTON, at a regularly-called meeting thereof, held this 7th day of  
November\_\_\_\_, 2002.

CITY COUNCIL

By:   
Mayor

Approved as to form:

  
City Attorney

Attest:

  
City Clerk

SUMMARY FOR PUBLICATION

ORDINANCE 1193

CITY OF LACEY

The City Council of the City of Lacey, Washington, passed on November 7, 2002, Ordinance No. 1193, entitled "AN ORDINANCE OF THE CITY OF LACEY, WASHINGTON, ADOPTING ADDITIONAL AMENDMENTS TO THE ENVIRONMENTAL PROTECTION AND RESOURCE CONSERVATION PORTION OF THE CITY'S COMPREHENSIVE PLAN AND APPROVING A SUMMARY FOR PUBLICATION.

The main points of the Ordinance are described as follows:

1. After public hearings and review by the Planning Commission, the Commission recommended to the Council modifications to the City's Environmental Protection and Resource Conservation Plan which forms a portion of the City's Comprehensive Plan. The recommended text changes to the wetlands portion of that plan were adopted by Ordinance No. 1190.
2. This Ordinance adopts text modifications to the fish and wildlife habitat conservation areas, geologically sensitive areas and aquifer protection areas portions of the plan.

A copy of the full text of this Ordinance will be mailed without charge to any person requesting the same from the City of Lacey.

Published: November 11, \_\_\_\_\_, 2002.

Monday

III. FISH AND WILDLIFE HABITAT CONSERVATION AREAS

A. Primary Issues

1. Preservation of Fish and Wildlife Habitat:

The preservation of fish and wildlife habitat is critical to the protection of suitable environments for animal species and in providing a natural beauty and healthy quality of life for Lacey and its citizens.

2. State Priority Habitat Program:

The Washington Department of Fish and Wildlife has established a priority habitats and species program. Priority habitats and priority species that need to be protected are being identified statewide.

3. Growth Management Act Requirements:

The Growth Management Act recognizes the importance of protecting habitat areas and Washington's wildlife. The Growth Management Act requires cities to identify and protect fish and wildlife habitat conservation areas.

B. Definitions Applicable to Fish and Wildlife Habitat Conservation

1. Fish and wildlife habitat conservation areas:

The Department of Community Trade and Economic Development's Office of Community Development (OCD) guidelines define fish and wildlife habitat conservation areas as "land management for maintaining species in suitable habitats within their natural geographic distribution so that isolated sub-populations are not created." It is anticipated that cooperative and coordinated land use planning is required among counties and cities in the region to adequately protect important habitat areas.

2. Priority habitats:

The Washington Department of Fish and Wildlife defines a priority habitat as:

**PRIORITY HABITAT:** A habitat type with unique or significant value to many species. An area identified and mapped as priority habitat has one or more of the following attributes:

- comparatively high fish and wildlife density
- comparatively high fish and wildlife species diversity
- important fish and wildlife breeding habitat
- important fish and wildlife seasonal ranges
- important fish and wildlife movement corridors
- limited availability
- high vulnerability to habitat alteration
- unique or dependent species

A priority habitat may be described by a unique vegetation type or by a dominant plant species that is of primary importance to fish and wildlife (e.g., oak woodlands, eelgrass meadows). A priority habitat may also be described by a successional stage (e.g., old growth and mature forests). Alternatively, a priority habitat may consist of a specific habitat element (e.g., consolidated marine/estuarine shorelines, talus slopes, caves, snags) of key value to fish and wildlife.

3. Priority species:

Priority species are those species that are of concern due to their population status and their sensitivity to habitat manipulation. The Washington Department of Fish and Wildlife defines a priority species as "fish and wildlife species requiring protective measures and/or management guidelines to ensure their perpetuation." Priority species include those which are state listed endangered, threatened, and sensitive species, as well as other species of concern, such as monitor species and game and non-game species.

C. Analysis/Methodology

1. Fish and wildlife habitat conservation areas:

The ~~Office of Community Development~~ OCD has listed a number of elements that need to be considered in designating fish and wildlife habitat conservation areas. These include:

- a. Areas with which endangered, threatened, and sensitive species have a primary association;
- b. Habitats and species of local importance;
- c. Commercial and recreation shellfish areas:

- d. Kelp and eelgrass beds, herring and smelt spawning areas;
  - e. Naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish and wildlife habitat;
  - f. Waters of the state;
  - g. Lakes, ponds, streams and rivers planted with game fish by governmental or tribal entities; or
  - h. State natural area preserves and natural resource conservation areas.
2. Endangered, threatened and sensitive species and habitats and species of local importance; the Priority Habitat And Species Program:

a. Priority Habitat And Species Program:

The Washington Department of Fish and Wildlife has established a Priority Habitat and Priority Species Program. The Washington Department of Fish and Wildlife's PHS program defines "priority species" as wildlife species of concern due to their population status and their sensitivity to habitat alteration. WDFW biologists see these species as the most vulnerable to population declines and possible extirpation in the face of land clearing, road construction, residential and commercial development, and other land use changes.

The PHS list was derived from computer-based wildlife information that has been compiled from across the state over the last 30 years, as well as from the collective professional opinions of more than 300 Washington Department of Fish and Wildlife wildlife biologists, agents, and program managers.

The Department has mapped known areas within the state that contain habitats and species that are of particular importance. In designating areas within the City of Lacey that are endangered, threatened, sensitive or of local importance, the Washington Department of Fish and Wildlife information is the best available. In this program, specific species are listed and a set of management recommendations are provided for each. The Washington

Department of Fish and Wildlife recommendations for given wildlife species will be developed in one of two ways:

- i) **Species Recommendations:** Specific management guidelines/recommendations will be developed for the particular species. Species receiving individual plans will have special recommendations.
- ii) **Priority Habitat:** Specific management guidelines/recommendations will not be developed for a particular species, but instead the Washington Department of Fish and Wildlife will develop guidelines designed to protect the habitat type in which the species is found, thereby affording protection to this and other species in that habitat type.

b. **Criteria:**

Three criteria were used when considering the inclusion of a species on the PHS list. The criteria are as listed below:

**Criterion 1: State Listed and Candidate Species:**

State listed species are those native fish and wildlife species legally designated as Endangered (WAC 232-12-014), Threatened (WAC 232-12-011) or Sensitive (WAC 232-12-011). State Candidate species are those fish and wildlife species that will be reviewed by the department (POL-M-6001) for possible listing as Endangered, Threatened, or Sensitive according to the process and criteria defined in WAC 232-12-297.

**Criterion 2: Vulnerable Aggregations:**

Vulnerable aggregations include those species or groups of animals susceptible to significant population declines, within a specific area or statewide, by virtue of their inclination to aggregate. Examples include heron rookeries, seabird concentrations, marine mammal haulouts, shellfish beds, and fish spawning and rearing areas.

**Criterion 3: Species of Recreational, Commercial, and/or Tribal Importance that are Vulnerable:**

Native and non-native fish and wildlife species of recreational or commercial importance, and recognized species used for tribal ceremonial and subsistence purposes, that are vulnerable to habitat loss or degradation.

c. Relationship to other lists:

The PHS list of species is one of several wildlife "lists" or categories developed and maintained by WDFW. The Department has statutory authority to list wildlife species as "endangered", "threatened", or "sensitive."

- i) Endangered species are wildlife species native to the state of Washington that are seriously threatened with extinction throughout all or a significant portion of their range within the state. Endangered species are legally designated in WAC 232-12-014.
- ii) Threatened species are wildlife species native to the state of Washington that are likely to become an endangered species within the foreseeable future throughout a significant portion of their range within the state without cooperative management or removal of threats. Threatened species are legally designated in WAC 232-12-011.
- iii) Sensitive species are wildlife species native to the state of Washington that are vulnerable or declining and are likely to become endangered or threatened in a significant portion of their range within the state without cooperative management or removal of threats. Sensitive species are legally designated in WAC 232-12-011.

WDFW has prepared a list of "candidate" species that will be reviewed for possible listing as endangered, threatened, or sensitive species.

Two additional categories of wildlife that have been designated through statutory authority by WDFW are "game" and "nongame." Game species are wildlife species that may be hunted, fished, and/or trapped as authorized by the Wildlife Commission. Nongame species are, for the most part, wildlife species not included in any of the above categories: these include protected (may not be hunted or fished) and non-protected (unclassified) wildlife.



The current list of PHS species is a subset of endangered, threatened, sensitive, candidate, monitor, game, and nongame species.

d. PHS and SOC list summary:

The Washington Department of Fish and Wildlife (WDFW) publishes a Priority Habitats and Species (PHS) list and a Species of Concern (SOC) list.

The PHS List is a catalog of habitats and species considered to be priorities for conservation and management. *Priority species* require protective measures for their perpetuation due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. *Priority species* include State Endangered, Threatened, Sensitive, and Candidate species. *Priority habitats* are those habitat types or elements with unique or significant value to a diverse assemblage of species.

There are 18 habitat types, 140 vertebrate species, 28 invertebrate species, and 14 species groups currently on the PHS List. These constitute about 16% of Washington's approximately 1000 vertebrate species and a fraction of the state's invertebrate fauna.

The SOC List, published by the Wildlife Management Program, includes only native Washington Fish and Wildlife species that are listed as Endangered, Threatened, or Sensitive, or as Candidates for these designations. Endangered, Threatened, and Sensitive species are legally established in Washington Administrative Codes. Candidate species are established by WDFW policy. As of this writing there are 26 Endangered, 11 Threatened, 6 Sensitive, and 103 Candidate species on the SOC List.

It is important to note that many PHS species are very local in distribution, so that only a portion of these species will be found in any given county. For example, Beller's ground beetles only occur in a few sites in King County, Columbian white-tailed deer only occur in isolated locations in Wahkiakum County, and the golden hairstreak butterfly in Washington is limited to a single grove of trees in southern Skamania County. The number of PHS species likely to be found in the City of Lacey is only a small fraction of the total PHS species.

e. Getting beyond endangered and threatened:

Restricting planning activities to only endangered and threatened species would inadequately address wildlife issues by omitting important categories of Washington wildlife. It would also appear contrary to the principles and best practices of the art and science of land use planning. Endangered and threatened species represent mistakes that have already happened, poor judgments that have already been made, or lack of adequate consideration in land use changes that have already occurred. A single focus on just these two categories of wildlife is a reactive mode of planning that only addresses ways to mend past neglect and mismanagement. The true spirit of land use planning anticipates potential conflicts and responds to these in a proactive manner before they become real problems. Therefore, effective planning for wildlife must include consideration of those species that are currently being pushed in the direction of endangered or threatened status. This can be done by including PHS species that are now classified as sensitive, candidate, or game/nongame as priority species.

f. "classification" categories:

In adopting categories of wildlife that reflect differing population levels and responses to habitat change, WDFW recognizes that wildlife species have varying needs for protection. The minimum guidelines prepared by ~~CTED~~ ~~OCD~~ suggest that local governments develop additional levels of classification within their "priority habitat areas." WDFW offers the classification scheme outline below as a more sophisticated way for local jurisdictions to delineate and prioritize wildlife categories according to their need for protection:

Category 1:            PHS Endangered  
                             PHS Threatened  
                             PHS Sensitive

Category 2:            PHS Candidate        and        PHS  
                             Game/Nongame

Category 3: All other wildlife

The ranking of categories as shown above is consistent with the rarity and vulnerability of species in these categories throughout the state.

g. Applying protection strategies to classification categories:

Regulatory protection measures can be applied in the following manner:

Category 1: (PHS endangered, threatened, sensitive): habitat management plan that would include a permanent protected area, to be approved by WDFW.

Category 2: (PHS candidate and PHS game/non-game): habitat management plan approved by WDFW.

Category 3: (all other wildlife): SEPA checklist, with review at WDFW's option.

Befitting the spirit of the GMA, suggested protection strategies require a long-term cooperative relationship with WDFW.

Known areas in the City of Lacey and Lacey's urban growth area that are designated for priority habitat or species are shown in Map 4.

The Washington Department of Fish and Wildlife has provided local jurisdictions with a list of those species that are in the priority habitats and species program. Some 143 species are listed as occurring in the Region 6 area which includes Clallam, Grays Harbor, Jefferson, Kitsap, Mason, Pacific, and Thurston Counties. Table 8A lists those species, along with the criteria for being placed in the priority habitats program, and status of the species. Table 9 lists management practices and Table 10 how management practices apply to designated species.

The Washington Department of Fish and Wildlife has also provided information regarding priority habitat types. Table 11 lists those habitat types that are found in the City of Lacey or Lacey's urban growth area.



Table 8A

**PRIORITY SPECIES**

**AMPHIBIANS, REPTILES, BIRDS, MAMMALS, & INVERTEBRATES**

Found in Region 6: Clallam, Grays Harbor, Jefferson, Kitsap, Mason, Pacific, Pierce and Thurston Counties. Composed from information in the Washington Department of Fish and Wildlife July 1999 Publication Priority Habitats and Species List."

COMMON NAME <i>Scientific Name</i>	SPECIES CRITERIA	WASHINGTON STATUS * Priority Area
<b>INVERTEBRATES</b>		
<b>MOLLUSCS</b>		
<b>Gastropods (Gastropoda)</b>		
Newcomb's littorine snail <i>Algamorda subrotundata</i>	1, 2	State Listed or Candidate Species * Any occurrence
Pinto (Northern) abalone <i>Haliotis kamtschatkana</i>	1, 2, 3	State Listed or Candidate Species * Any occurrence
<b>Bivalves (Bivalva)</b>		
Goeduck clam <i>Panopea abrupta</i>	2, 3	Shellfish * Regular and regular large concentrations
Hardshell clams Butter clam <i>Saxidomus giganteus</i> Littleneck clam <i>Protothaca staminea</i> Japanese littleneck clam <i>Tapes philippinarum</i>	2, 3	Shellfish * Regular and regular large concentrations
Olympia oyster <i>Ostrea lurida</i>	1, 2, 3	State Listed or Candidate Species Shellfish * Any occurrence, regular and regular large concentrations
Pacific oyster <i>Crassostrea gigas</i>	2, 3	Shellfish * Regular and regular large concentrations
Razor clam <i>Siliqua patula</i>	2, 3	Shellfish * Regular and regular large concentrations

COMMON NAME <i>Scientific Name</i>	SPECIES CRITERIA	WASHINGTON STATUS * Priority Area
<b>ARTHROPODS</b>		
<b>Crustaceans (Crustacea)</b>		
Dungeness crab <i>Cancer magister</i>	2, 3	Shellfish * Breeding areas, regular and regular large concentrations
Pandalid shrimp (Pandalidae) <i>Pandalus</i> spp.	2, 3	Shellfish * Regular and regular large concentrations
<b>Butterflies (Lepidoptera)</b>		
Johnson's hairstreak <i>Mitoura johnsoni</i>	1	State Listed or Candidate Species * Any occurrence
Mardon skipper <i>Polites mardon</i>	1	State Listed or Candidate Species * Any occurrence
Makah copper <i>Lycaena mariposa charlottensis</i>	1	State Listed or Candidate Species * Any occurrence
Oregon silverspot <i>Speyeria zerene hippolyta</i>	1	State Listed or Candidate Species * Any occurrence
Valley silverspot <i>Speyeria zerene bremnerii</i>	1	State Listed or Candidate Species * Any occurrence
Whulge checkerspot <i>Euphydryas editha taylori</i>	1	State Listed or Candidate Species * Any occurrence
<b>ECHINODERMS</b>		
Red urchin <i>Strongylocentrotus franciscanus</i>	3	Shellfish * Regular and regular large concentrations
<b>VERTEBRATES</b>		
<b>FISH</b>		
<b>Lamprey (Petromyzontidae)</b>		
River Lamprey <i>Lampetra ayresi</i>	1	State Listed or Candidate Species * Any occurrence
<b>Sturgeon (Acipenseridae)</b>		
Green sturgeon <i>Acipenser medirostris</i>	2, 3	Food fish * Any occurrence
White sturgeon <i>Acipenser transmontanus</i>	2, 3	Food fish * Any occurrence
<b>Herring (Clupeidae)</b>		
Pacific herring <i>Clupea pallasii</i>	1, 2, 3	State Listed or Candidate Species Food Fish * Breeding areas, regular large concentrations
<b>Mudminnows (Umbridae)</b>		

COMMON NAME <i>Scientific Name</i>	SPECIES CRITERIA	WASHINGTON STATUS * Priority Area
Olympic mudminnow <i>Novumbra hubbsi</i>	1	State Listed or Candidate Species * Any occurrence
<b>Catfishes (Ictaluridae)</b>		
Channel catfish <i>Ictalurus punctatus</i>	3	Game * Any occurrence
<b>Smelt (Osmeridae)</b>		
Eulachon <i>Thaleichthys pacificus</i>	1, 2, 3	State Listed or Candidate Species Food fish * Regular concentrations
Longfin smelt <i>Spirinchus thaleichthys</i>	2, 3	Food fish * Breeding areas, regular large concentrations
Surfsmelt <i>Hypomesus pretiosus</i>	2, 3	Food fish * Breeding areas, regular large concentrations
<b>Trout, Salmon, &amp; Whitefishes (Salmonidae)</b>		
Bull Trout/Dolly Varden <i>Salvelinus confluentis/S. malma</i>	1, 2, 3	State Listed or Candidate Species Game * Any occurrence
Chinook salmon <i>Oncorhynchus tshawytscha</i>	1, 2, 3	State Listed or Candidate Species Food fish * Any occurrence
Chum salmon <i>Oncorhynchus keta</i>	1, 2, 3	State Listed or Candidate Species Food fish * Any occurrence
Coastal resident/Searun cutthroat <i>Oncorhynchus clarki clarki</i>	3	Game * Any occurrence
Coho salmon <i>Oncorhynchus kisutch</i>	2, 3	Food fish * Any occurrence
Kokanee <i>Oncorhynchus nerka</i>	3	Game * Any occurrence
Pink Salmon <i>Oncorhynchus gorbuscha</i>	2, 3	Food fish * Any occurrence
Pygmy whitefish <i>Prosopium coulteri</i>	1, 2	State Listed or Candidate Species * Any occurrence
Rainbow trout/Steelhead <i>Oncorhynchus mykiss</i>	1, 3	State Listed or Candidate Species Game * Any occurrence
Sockeye salmon <i>Oncorhynchus nerka</i>	1, 2, 3	State Listed or Candidate Species Food fish * Any occurrence

COMMON NAME <i>Scientific Name</i>	SPECIES CRITERIA	WASHINGTON STATUS * Priority Area
Westslope cutthroat <i>Oncorhynchus clarki lewisi</i>	3	Game * Any occurrence
Cods (Gadidae)		
Pacific cod <i>Gadus macrocephalus</i>	1, 2, 3	State Listed or Candidate Species Food fish * Breeding areas, regular and regular large concentrations
Pacific hake <i>Merluccius productus</i>	1, 2, 3	State Listed or Candidate Species Food fish * Breeding areas, regular and regular large concentrations
Walleye pollock <i>Theragra chalcogramma</i>	1, 2, 3	State Listed or Candidate Species Food fish * Breeding areas, regular and regular large concentrations
Rockfish (Scorpaenidea)		
Black rockfish <i>Sebastes melanops</i>	1, 2, 3	State Listed or Candidate Species Food fish * Regular and regular large concentrations
Bocaccio rockfish <i>Sebastes paucispinis</i>	1, 2, 3	State Listed or Candidate Species Food fish * Regular and regular large concentrations
Brown rockfish <i>Sebastes auriculatus</i>	1, 2, 3	State Listed or Candidate Species Food fish * Regular and regular large concentrations
Canary rockfish <i>Sebastes pinniger</i>	1, 2, 3	State Listed or Candidate Species Food fish * Regular and regular large concentrations
China rockfish <i>Sebastes nebulosus</i>	1, 2, 3	State Listed or Candidate Species Food fish * Any occurrence
Copper rockfish <i>Sebastes caurinus</i>	1, 2, 3	State Listed or Candidate Species Food fish * Regular and regular large concentrations
Greenstriped rockfish <i>Sebastes elongatus</i>	1, 2, 3	State Listed or Candidate Species Food fish * Regular and regular large



COMMON NAME <i>Scientific Name</i>	SPECIES CRITERIA	WASHINGTON STATUS * Priority Area
		concentrations
Quillback rockfish <i>Sebastes maliger</i>	1, 2, 3	State Listed or Candidate Species Food fish * Regular and regular large concentrations
Redstripe rockfish <i>Sebastes proriger</i>	1, 2, 3	State Listed or Candidate Species Food fish * Regular and regular large concentrations
Tiger rockfish <i>Sebastes nigrocinctus</i>	1, 2, 3	State Listed or Candidate Species Food fish * Any occurrence
Widow rockfish <i>Sebastes entomelas</i>	1, 2, 3	State Listed or Candidate Species Food fish * Regular and regular large concentrations
Yelloweye rockfish <i>Sebastes ruberrimus</i>	1, 2, 3	State Listed or Candidate Species Food fish * Any occurrence
Yellowtail rockfish <i>Sebastes flavidus</i>	1, 2, 3	State Listed or Candidate Species Food fish * Regular and regular large concentrations
<b>Greenlings (Hexagrammidae)</b>		
Lingcod <i>Ophiodon elongatus</i>	2, 3	Food fish * Any occurrence
<b>Sunfishes (Centrarchidae)</b>		
Largemouth bass <i>Micropterus salmoides</i>	3	Game * Any occurrence
Smallmouth bass <i>Micropterus dolomieu</i>	3	Game * Any occurrence
<b>Sand Lances (Ammodytidae)</b>		
Pacific sand lance <i>Ammodytes hexapterus</i>	2, 3	Food fish * Breeding areas, regular large concentrations
<b>Right-eye flounders (Pleuronectidae)</b>		
English sole <i>Parophrys vetulus</i>	3	Food fish * Breeding site
Rock sole <i>Lepidopsetta bilineata</i>	3	Food fish * Breeding areas, regular large concentrations

COMMON NAME <i>Scientific Name</i>	SPECIES CRITERIA	WASHINGTON STATUS * Priority Area
<b>AMPHIBIANS</b>		
<b>Salamanders (Caudata)</b>		
Cascades torrent salamander <i>Rhyacotriton cascadae</i>	1	State Listed or Candidate Species * Any occurrence
Columbia torrent salamander <i>Rhyacotriton kezeri</i>	1	State Listed or Candidate Species * Any occurrence
Dunn's salamander <i>Plethodon dunni</i>	1	State Listed or Candidate Species * Any occurrence
Van Dyke's salamander <i>Plethodon vandykei</i>	1	State Listed or Candidate Species * Any occurrence
<b>Frogs and Toads (Anura)</b>		
Oregon spotted frog <i>Rana pretiosa</i>	1	State Listed or Candidate Species * Any occurrence
Western toad <i>Bufo boreas</i>	1	State Listed or Candidate Species * Any occurrence
<b>REPTILES</b>		
<b>Turtles (Tsetudines)</b>		
Western pond turtle <i>Clemmys marmorata</i>	1	State Listed or Candidate Species * Any occurrence
<b>Snakes (Serpentes)</b>		
Sharptail snake <i>Contia tenuis</i>	1	State Listed or Candidate Species * Any occurrence
<b>BIRDS</b>		
<b>Marine birds</b>		
Brandt's cormorant <i>Phalacrocorax penicillatus</i>	1, 2	State Listed or Candidate Species * Breeding areas, regular and regular large concentrations
Brown pelican <i>Pelecanus occidentalis</i>	1, 2	State Listed or Candidate Species * Regular concentrations in foraging and resting areas
Cassin's auklet <i>Ptychoramphus aleuticus</i>	1, 2	State Listed or Candidate Species * Breeding areas
Common loon <i>Gavia immer</i>	1, 2	State Listed or Candidate Species * Breeding sites, regular and regular large concentrations
Common murre <i>Uria aalge</i>	1, 2	State Listed or Candidate Species * Breeding areas, regular and regular large concentrations
Marbled murrelet <i>Brachyramphus marmoratus</i>	1, 2	State Listed or Candidate Species * Any occurrence in suitable habitat during breeding season, regular and regular large

COMMON NAME <i>Scientific Name</i>	SPECIES CRITERIA	WASHINGTON STATUS * Priority Area
		concentrations
Short-tailed albatross <i>Phoebastria albatrus</i>	1	State Listed or Candidate Species * Any occurrence
Tufted puffin <i>Fratercula cirrhata</i>	1, 2, 3	State Listed or Candidate Species * Regular concentrations, breeding areas
Western Washington nonbreeding concentrations of: Loons (Gaviidae) Grebes (Podicipedidae) Cormorants (Phalacrocoracidae) Fulmar, Shearwaters (Procellariidae) Storm-petrels (Hydrobatidae) Alcids (Alcidae)	2	* Regular large concentrations
Western Washington breeding concentrations of: Cormorants (Phalacrocoracidae) Storm-petrels (Hydrobatidae) Terns (Laridae) Alcids (Alcidae)	2	* Breeding areas
<b>Hérons (Ardeidae)</b>		
Black-crowned night heron <i>Nycticorax nycticorax</i>	2	* Breeding areas
Great blue heron <i>Ardea herodias</i>	2	* Breeding areas
<b>Waterfowl (Anseriformes)</b>		
Aleutian Canada goose <i>Branta canadensis leucopareia</i>	1	State Listed or Candidate Species * Regular concentrations
Brant <i>Branta bernicla</i>	2, 3	Game * Regular large concentrations in foraging and resting areas, migratory stopovers
Cavity-nesting ducks Wood duck <i>Aix sponsa</i> Barrow's goldeneye <i>Bucephala islandica</i> Common goldeneye <i>Bucephala clangula</i> Bufflehead <i>Bucephala albeola</i>	3	Game * Breeding areas

COMMON NAME <i>Scientific Name</i>	SPECIES CRITERIA	WASHINGTON STATUS * Priority Area
Hooded merganser <i>Lophodytes cucullatus</i>		
Western Washington nonbreeding concentrations of: Barrow's goldeneye <i>(Bucephala islandica)</i> Common goldeneye <i>(Bucephala clangula)</i> Bufflehead <i>(Bucephala albeola)</i>	2, 3	Game * Regular large concentrations
Harlequin duck <i>Histrionicus histrionicus</i>	2, 3	Game * Breeding areas, regular and regular large concentrations in saltwater
Swans Trumpeter swan <i>Cygnus buccinator</i> Tundra swan <i>Cygnus columbianus</i>	2, 3	Game * Regular and regular large concentrations
Waterfowl concentrations (Anatidae excluding Canada geese in urban areas)	2, 3	Game * Significant breeding areas and regular large concentrations in winter
<b>Hawks, Falcons, Eagles</b> (Falconiformes)		
Bald eagle <i>Haliaeetus leucocephalus</i>	1	State Listed or Candidate Species * Breeding areas, communal roosts, regular and regular large concentrations, regularly-used perch trees in breeding areas
Golden eagle <i>Aquila chrysaetos</i>	1	State Listed or Candidate Species * Breeding and foraging areas
Merlin <i>Falco columbarius</i>	1	State Listed or Candidate Species * Breeding sites
Northern goshawk <i>Accipiter gentilis</i>	1	State Listed or Candidate Species * Breeding areas, including alternate nest sites, post-fledgling foraging areas
Peregrine falcon <i>Falco peregrinus</i>	1	State Listed or Candidate Species * Breeding areas, regular occurrences, hack sites
<b>Upland Game Birds (Galliformes)</b>		

COMMON NAME <i>Scientific Name</i>	SPECIES CRITERIA	WASHINGTON STATUS * Priority Area
Blue grouse <i>Dendragapus obscurus</i>	3	Game * Breeding areas, regular concentrations
Mountain quail <i>Oreortyx pictus</i>	3	Game * Any occurrence
Wild turkey <i>Meleagris gallopavo</i>	3	Game * Regular and regular large concentrations and roosts in WDFW's Primary Management Zones for wild turkeys
<b>Cranes (Gruiformes)</b>		
Sandhill crane <i>Grus canadensis</i>	1	State Listed or Candidate Species * Breeding areas, regular large concentrations, migration staging areas
<b>Shorebirds (Charadriiformes)</b>		
Snowy plover <i>Charadrius alexandrinus</i>	1	State Listed or Candidate Species * Breeding areas
Western Washington nonbreeding concentrations of: Charadriidae (plovers, etc.) Scolopacidae (sandpipers, etc.) Phalaropodidae (phalaropes)	2	* Regular large concentrations
<b>Pigeons (Columbiformes)</b>		
Band-tailed pigeon <i>Columba fasciata</i>	3	Game * Breeding areas, regular concentrations, occupied mineral springs
<b>Owls (Strigiformes)</b>		
Spotted owl <i>Strix occidentalis</i>	1	State Listed or Candidate Species * Any occurrence
<b>Swifts (Apodiformes)</b>		
Vaux's swift <i>Chaetura vauxi</i>	1	State Listed or Candidate Species * Breeding areas, communal roosts
<b>Woodpeckers (Piciformes)</b>		
Pileated woodpecker <i>Dryocopus pileatus</i>	1	State Listed or Candidate Species * Breeding areas
<b>Perching Birds (Passeriformes)</b>		
Oregon vesper sparrow <i>Pooecetes gramineus affinis</i>	1	State Listed or Candidate Species * Any occurrence
Purple martin	1	State Listed or Candidate Species

COMMON NAME <i>Scientific Name</i>	SPECIES CRITERIA	WASHINGTON STATUS * Priority Area
<i>Progne subis</i>		* Breeding areas, including used artificial nest features, feeding areas
Slender-billed, white-breasted nuthatch <i>Sitta carolinensis aculeata</i>		State Listed or Candidate Species * Any occurrence
Streaked, horned lark <i>Eremophila alpestris strigata</i>		State Listed or Candidate Species * Any occurrence
<b>MAMMALS</b>		
<b>Bats (Chiroptera)</b>		
Roosting concentrations of: Big brown bat <i>Eptesicus fuscus</i> Myotis bats ( <i>Myotis</i> spp.) Pallid bat <i>Antrozous pallidus</i>	2	* Regular large concentrations in naturally occurring breeding areas and other communal roosts
Townsend's big-eared bat <i>Corynorhinus townsendii</i>	1, 2	State Listed or Candidate Species * Any occurrence
<b>Rodents (Rodentia)</b>		
Western gray squirrel <i>Sciurus griseus</i>	1	State Listed or Candidate Species * Any occurrence
Western pocket gopher <i>Thomomys mazama</i>	1	State Listed or Candidate Species * Any occurrence
<b>Terrestrial Carnivores (Carnivora)</b>		
Fisher <i>Martes pennanti</i>	1	State Listed or Candidate Species * Any occurrence
Marten <i>Martes americana</i>	3	Game * Regular occurrences
Mink <i>Mustela vison</i>	3	Game * Regular occurrences
Wolverine <i>Gulo gulo</i>	1	State Listed or Candidate Species * Any occurrence
<b>Marine Mammals (Cetacea and Carnivora)</b>		
Dall's porpoise <i>Phocoenoides dalli</i>	2	* Regular concentrations in foraging areas and migration routes
Gray whale <i>Eschrichtius robustus</i>	1, 2	State Listed or Candidate Species * Any occurrence, migration routes
Harbor seal <i>Phoca vitulina</i>	2	* Haulout areas

COMMON NAME <i>Scientific Name</i>	SPECIES CRITERIA	WASHINGTON STATUS * Priority Area
Killer whale <i>Orcinus orca</i>	2	* Regular concentrations in feeding areas and migration routes
Pacific harbor porpoise <i>Phocoena phocoena</i>	1, 2	State Listed or Candidate Species * Regular concentrations in foraging areas and migration routes
Sea lion, California <i>Zalophus californianus</i>	2	* Haulout areas
Sea lion, Steller (Northern) <i>Eumetopias jubatus</i>	1, 2	State Listed or Candidate Species * Haulout areas
Sea otter <i>Enhydra lutris</i>	1, 2	State Listed or Candidate Species * Regular concentrations
<b>Big Game Ungulates (Artiodactyla)</b>		
Columbian black-tailed deer <i>Odocoileus hemionus columbianus</i>	3	Game * Breeding areas, regular and regular large concentrations
Mountain goat <i>Oreamnos americanus</i>	3	Game * Breeding areas, regular concentrations
Rocky Mountain elk <i>Cervus elaphus nelsoni</i>	3	Game * Calving areas, migration corridors, regular and regular large concentrations in winter
Roosevelt elk <i>Cervus elaphus roosevelti</i>	3	Game * Calving areas, migration corridors, regular and regular large concentrations in winter, regular large concentrations in foraging areas along coastal waters

**SPECIES CRITERIA** - Refer to criteria discussed in section C2b.

**WASHINGTON STATUS:** Identifies State Listed or Candidate species (Species of Concern) and species classified as game, food fish, or shellfish.

## Table 9

### PHS MANAGEMENT PRACTICES

The following wildlife management practices were published in the Washington Department of Fish and Wildlife publication "Management Recommendations for Washington Priority Habitats and Species" in 1991. Many new publications with recommendations for specific species are now available and are continually being developed and updated, according to the principals of best available science, and should be consulted to ensure consideration of the most current strategies for protecting listed species. The following numbered practices are not ranked.

1. Permanent protected area: an area around the nest site (or roost site for eagles) of the PHS species. No permanent land use change should be allowed within the protected area. This is the primary management practice for six PHS species, and is often used in conjunction with the secondary management practices of limiting human disturbance.
2. Conditioned area: establish a buffer around the habitat or important habitat component of the PHS species, within which land use changes are restricted or conditioned. This is the primary management practice for five PHS species, and for those species it is often used in conjunction with the secondary management practice of limiting chemical applications.
3. Natural habitat: maintain a natural habitat providing a suitable combination of food, water, and shelter relatively free of human disturbance. This is the primary management practice that is most often applied to large, wide-ranging animals outside typical urbanizing areas, and therefore it has limited use by city/county planners for PHS species.
4. Selective logging: limit clearcuts and/or include special harvest considerations. This is the primary management practice for nine PHS species, all of which are not typically associated with urban or urbanizing areas; therefore, this technique is of greater use to forest planners than to city/county planners. It is often used in conjunction with the secondary management practice of limiting human disturbance and timing restrictions.
5. Maintain a particular successional stage (e.g., old growth forest or grass meadow), plan community (e.g., oak forest), or plan species (e.g., golden chinquapin for golden hairstreak butterfly). This is the primary management practice for seven PHS species.
6. Create and/or maintain snags. Cavity-nesting birds have this as their primary management practice, including seven PHS species/groups. This



technique is often used in conjunction with special timber harvest considerations and the restriction of chemicals (especially aerial insecticides).

7. Maintain the structural integrity of wetlands. Three PHS species have this as their primary management technique.
8. Maintain the structural integrity of riparian areas. Twelve PHS species have this as their primary management practice, attesting to the importance of riparian areas to wildlife. Other important management practices for riparian areas are the retention of conditioned areas (buffers), limiting in-stream structures, and restricting adjacent roads.
9. Limit human disturbance and/or apply timing restrictions to accommodate seasonal variations in species' sensitivities to disturbance; indicated for 19 PHS species.
10. Retain downed logs/stumps, which are critical for foraging, basking, or den sites; indicated for 6 PHS species.
11. Allow natural regeneration of logged/burned areas so that a shrub seral stage can develop; indicated for 1 PHS species.
12. Maintain water flow and water quality; control stormwater runoff; indicated for 7 PHS species.
13. Limit in-stream structures, such as bridges, piers, boat ramps, or culverts which impede the animal's natural movements; indicated for 7 PHS species, all of which are fish.
14. Limit the amount of roadway and/or restrict their placement; indicated for 18 PHS species, primarily wide-ranging forest species or species utilizing riparian areas.
15. Limit chemical applications, including insecticides, herbicides, rodenticides, and piscicides, which may kill an animal directly through toxic exposure or indirectly by eliminating its food resource; indicated for 25 PHS species.
16. Limit non-native and/or introduced animals which may act as competitors or predators; indicated for 8 PHS species.
17. Limit scientific collecting; indicated for 2 PHS species, both of which are salamanders.

18. Limit cattle and sheep access and grazing, as these animals compete for browse and/or trample wildlife habitat; indicated for 10 PHS species.
19. Limit wire fences to allow free movement of animals; indicated for 2 PHS species.
20. Modify powerlines to prevent electrocution; indicated for 1 PHS species.
21. Provide artificial nest sites or nest boxes; indicated for 5 PHS species.

Table 10

**WILDLIFE MANAGEMENT PRACTICES FOR SELECTED PHS SPECIES**

The following general management practices were published by the Washington Department of Fish and Wildlife in "Management Recommendations for Washington Priority Habitats and Species" in 1991. Many new publications with recommendations for specific species are now available and are continually being developed, according to the principals of best available science, and updated and should be consulted to ensure consideration of the most current strategies for protecting listed species.

Species are grouped according to their management practice (boldface and underlined); important supplemental practices are underlined. Numbers correspond to numbered management practices in Table 8B.

<b>SPECIES</b>	<b>MANAGEMENT PRACTICES</b>
<b><u>Protected Area</u></b>	
Bald eagle nest	1, 2, 4, 9, 15
Bald eagle roost	1, 2, 9
Common loon	1, 9, 21
Great blue heron	1, 2, 7, 9
Marbled murrelet	1, 2, 5, 9
Osprey	1, 2, 4, 6, 9, 14, 15
Townsend's bat	1, 2, 15
<b><u>Conditioned Areas</u></b>	
Band-tailed pigeon	2, 5, 15
Beller's ground beetle	2, 12, 15, 16
Hatch's click beetle	2, 12, 15, 16
Larch Mt. Salamander	2, 4, 9, 17
Long-horned leaf beetle	2, 12, 15, 16
<b><u>Wildlife Range</u></b>	
Bighorn sheep	3, 5, 9, 15, 16
Black-tailed deer	3, 5, 14
Col. White-tailed deer	3, 4, 8, 18
Golden eagle	1, 2, 3, 4, 9, 15, 20
Mountain caribou	3, 4, 5, 14
Pygmy shrew	3, 15

<b>SPECIES</b>	<b>MANAGEMENT PRACTICES</b>
<b><u>Selective Logging</u></b>	
Blue grouse	4, 5, 16, 18
Elk	4, 5, 9, 18
Lynx	4, 9, 18
Merriam's turkey	4, 5
Moose	4, 5, 9, 18
Mountain goat	4, 5, 9, 14
Rocky Mt. Mule deer	4, 6, 15
White-headed woodpecker	4, 5, 9, 14
White-tailed deer	
<b><u>Seral stage: plant community</u></b>	
Fisher	4, 5, 6, 10
Marten	2, 4, 5, 6, 10, 14
Vaux's swift	5, 6
Golden hairstreak butterfly	2, 4, 5, 15
Oregon silverspot butterfly	4, 5, 15
Pocket gopher	2, 5, 15
Western gray squirrel	2, 5, 14, 18, 21
<b><u>Snags/(pilings)</u></b>	
Black-backed woodpecker	2, 5, 6, 15
Cavity-nesting ducks	4, 6, 7, 21
Flammulated owl	4, 5, 6, 15
Lewis' woodpecker	4, 5, 6, 11, 15
Pileated woodpecker	4, 6, 10, 15
Purple martin	6, 15, 21
Western bluebird	5, 6, 21
<b><u>Maintain Wetlands</u></b>	
Sandhill crane	2, 5, 7, 9, 12, 14, 18, 19
Spotted frog	7, 8, 9, 12, 15, 16
Western pond turtle	2, 7, 10, 14, 15, 16, 18, 19
<b><u>Maintain riparian areas</u></b>	
Cutthroat	2, 8, 13, 14, 15
Dolly Varden	2, 8, 13, 14
Dunn's salamander	2, 4, 8, 10
Harlequin	2, 3, 8, 9, 12, 14
Kokanee	2, 8, 13, 14
Mountain sucker	2, 8, 13, 14
Mountain whitefish	2, 8, 13, 14
Olympic mudminnow	4, 7, 8, 12, 15, 16, 18
Pygmy whitefish	2, 8, 13, 14
Trout/steelhead	2, 8, 9, 13, 14, 15
Van Dyke's salamander	2, 4, 8, 10, 17
Yellow-billed cuckoo	7, 8, 15, 18

Table 11

**PRIORITY HABITAT TYPES**

<b>HABITAT TYPE or ELEMENT</b>	<b>* PRIORITY AREA</b>
<b>Aspen Stands</b>	<ul style="list-style-type: none"> <li>• Pure or mixed stands of aspen greater than 0.8 ha (2 acres).</li> </ul> <p>Criteria: High fish and wildlife species diversity, limited availability, high vulnerability to habitat alteration.</p>
<b>Caves</b>	<ul style="list-style-type: none"> <li>• A naturally occurring cavity, recess, void, or system of interconnected passages (including associated dendritic tubes, cracks, and fissures) which occurs under the earth in soils, rock, ice, or other geological formations, and is large enough to contain a human. Mine shafts may mimic caves, and those abandoned mine shafts with actual or suspected occurrences of priority species should be treated in a manner similar to caves. A mine is a man-made excavation in the earth usually used to extract minerals.</li> </ul> <p>Criteria: Comparatively high wildlife density, important wildlife breeding habitat and seasonal ranges, limited availability, vulnerability to human disturbance, dependent species.</p>
<b>Cliffs</b>	<ul style="list-style-type: none"> <li>• Greater than 7.6 m (25 ft) high and occurring below 1524 m (5000 ft).</li> </ul> <p>Criteria: Significant wildlife breeding habitat, limited availability, dependent species.</p>
<b>Estuary/ Estuary-like</b>	<ul style="list-style-type: none"> <li>• Deepwater tidal habitats and adjacent tidal wetlands, usually semi-enclosed by land but with open, partly obstructed or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The salinity may be periodically increased above that of the open ocean by evaporation. Along some low-energy coastlines there is appreciable dilution of sea water. Estuarine habitat extends upstream and landward to where ocean-derived salts measure less than 0.5% during the period of average annual low flow. Includes both estuaries and lagoons</li> </ul> <p>Criteria: High fish and wildlife density and species diversity, important breeding habitat, important fish and wildlife seasonal ranges and movement corridors, limited availability, high vulnerability to habitat alteration.</p>
<b>Freshwater Wetlands and Fresh Deepwater</b>	<ul style="list-style-type: none"> <li>• Freshwater Wetlands: Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands must have one or more of the following attributes: the land supports, at least periodically,</li> </ul>

	<p>predominantly hydrophytic plants; substrate is predominantly undrained hydric soils; and/or the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.</p> <ul style="list-style-type: none"> <li>• Fresh Deepwater: Permanently flooded lands lying below the deepwater boundary of wetlands. Deepwater habitats include environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live. The dominant plants are hydrophytes; however, the substrates are considered nonsoil because the water is too deep to support emergent vegetation. These habitats include all underwater structures and features (e.g., woody debris, rock piles, caverns).</li> </ul> <p><b>Criteria:</b> Comparatively high fish and wildlife density and species diversity, important fish and wildlife breeding habitat, important fish and wildlife seasonal ranges, limited availability, high vulnerability to habitat alteration.</p>
<p><b>Instream</b></p>	<ul style="list-style-type: none"> <li>• The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.</li> </ul> <p><b>Criteria:</b> Comparatively high fish and wildlife density and species diversity, important fish and wildlife seasonal ranges, limited availability, high vulnerability to habitat alteration, dependent species.</p>
<p><b>Marine/ Estuarine Shorelines</b></p>	<p>Shorelines include the intertidal and subtidal zones of beaches, and may also include the backshore and adjacent components of the terrestrial landscape (e.g., cliffs, snags, mature trees, dunes, meadows) that are important to shoreline associated fish and wildlife and that contribute to shoreline function (e.g., sand/rock/log recruitment, nutrient contribution, erosion control).</p> <ul style="list-style-type: none"> <li>• Consolidated Substrate: Rocky outcroppings in the intertidal and subtidal marine/estuarine environment consisting of rocks greater than 25 cm (10 in) diameter, hardpan, and/or bedrock</li> <li>• Unconsolidated Substrate: Substrata in the intertidal and subtidal marine environment consisting of rocks less than 25 cm (10 in) diameter, gravel, shell, sand, and/or mud.</li> </ul> <p><b>Criteria:</b> Comparatively high fish and wildlife density, high fish and wildlife species diversity, important fish and wildlife seasonal ranges, limited availability, high vulnerability to habitat alteration, dependent species.</p>
<p><b>Old-growth/ Mature Forests</b></p>	<ul style="list-style-type: none"> <li>• Old-growth west of Cascade crest: Stands of at least 2 tree species, forming a multi-layered canopy with occasional</li> </ul>

	<p>small openings; with at least 20 trees/ha (8 trees/acre) that are &gt; 81 cm (32 in) dbh or &gt; 200 years of age; and &gt; 10 snags/ha (4 snags/acre) over 51 cm (20 in) diameter and 4.6 m (15 ft) tall; with numerous downed logs, including 10 logs/ha (4 logs/acre) &gt; 61 cm (24 in) diameter and &gt; 15 m (50 ft) long. High elevation stands (<math>\geq</math> 762 m [2500 ft]) may have lesser dbh (&gt; 76 cm [30 in]), fewer snags (&gt;0.6/ha [1.5/acre]), and fewer large downed logs (0.8 logs/ha [2 logs/acre]) that are &gt; 61 cm (24 in) diameter and &gt; 15 m (50 ft) long.</p> <ul style="list-style-type: none"> <li>• Old-growth east of Cascade crest: Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be &gt; 150 years of age, with 25 trees/ha (10 trees/acre) &gt; 53 cm (21 in) dbh, and 2.5-7.5 snags/ha (1-3 snags/acre) &gt; 30-35 cm (12-14 in) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions.</li> <li>• Mature forests: Stands with average tree diameters exceeding 53 cm (21 in) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 – 200 years old west and 80 – 160 years old east of the Cascade crest.</li> </ul> <p><b>Criteria:</b> High fish and wildlife density, high fish and wildlife species diversity, important fish and wildlife breeding habitat, important fish and wildlife seasonal ranges, limited and declining availability, high vulnerability to habitat alteration</p>
<p><b>Oregon White Oak Woodlands</b></p>	<ul style="list-style-type: none"> <li>• Stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stands is <math>\geq</math> 25%; or where total canopy coverage of the stand is &lt;25% but oak accounts for at least 50% of the canopy coverage present. The latter is often referred to as oak savanna. In non-urbanized areas west of the Cascades, priority oak habitat consists of stands <math>\geq</math> 0.4 ha (1.0 ac) in size. East of the Cascades, priority oak habitat consists of stands <math>\geq</math> 2 ha (5 ac) in size. In urban or urbanizing areas, single oaks or stands &lt; 0.4 ha (1 ac) may also be considered a priority when found to be particularly valuable to fish and wildlife.</li> </ul> <p><b>Criteria:</b> Comparatively high fish and wildlife density, high fish and wildlife species diversity, limited and declining availability, high vulnerability to habitat alteration, dependent species.</p>
<p><b>Prairies and Steppe</b></p>	<ul style="list-style-type: none"> <li>• Relatively undisturbed areas (as indicated by dominance of native plants) where grasses and/or forbs form the natural</li> </ul>

	<p>climax plant community.</p> <p>Criteria: Comparatively high fish and wildlife density, high fish and wildlife species diversity, important fish and wildlife breeding habitat, important fish and wildlife seasonal ranges, limited and declining availability, high vulnerability to habitat alteration, unique and dependent species.</p>
Riparian	<ul style="list-style-type: none"> <li>The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other. In riparian systems, the vegetation, water tables, soils, microclimate, and wildlife inhabitants of terrestrial ecosystems are influenced by perennial or intermittent water. Simultaneously, the biological and physical properties of the aquatic ecosystems are influenced by adjacent vegetation, nutrient and sediment loading, terrestrial wildlife, as well as organic and inorganic debris. Riparian habitat encompasses the area beginning at the ordinary high water mark and extends to that portion of the terrestrial landscape that is influenced by, or that directly influences, the aquatic ecosystem. Riparian habitat includes the entire extent of the floodplain and riparian areas of wetlands that are directly connect to stream courses.</li> </ul> <p>Criteria: High fish and wildlife density, high fish and wildlife species diversity, important fish and wildlife breeding habitat, important wildlife seasonal ranges, important fish and wildlife movement corridors, high vulnerability to habitat alteration, unique or dependent species.</p>
Rural Natural Open Space	<ul style="list-style-type: none"> <li>A priority species resides within or is adjacent to the open space and uses it for breeding or regular feeding; and/or the open space functions as a corridor connecting other <i>priority habitats</i>, especially areas that would otherwise be isolated; and/or the open space is an isolated remnant of natural habitat larger than 4 ha (10 acres) and surrounded by agricultural developments. Local consideration may be given to open space areas smaller than 4 ha (10 acres).</li> </ul> <p>Criteria: Comparatively high fish and wildlife density, high fish and wildlife species diversity, important fish and wildlife breeding habitat, important fish and wildlife seasonal ranges, important fish and wildlife movement corridors, high vulnerability to habitat alteration, unique species assemblages in agricultural areas.</p>
Snags and Logs	<ul style="list-style-type: none"> <li>Snags and logs occur within a variety of habitat types that support trees. Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags</li> </ul>



	<p>have a diameter at breast height of <math>\geq 51</math> cm (20 in) in western Washington and <math>\geq 30</math> cm (12 in) in eastern Washington, and are <math>\geq 2</math> m (6.5 ft) in height. Priority logs are <math>\geq 30</math> cm (12 in) in diameter at the largest end, and <math>\geq 6</math> m (20 ft) long. Abundant snags and logs can be found in old-growth and mature forests or unmanaged forests of any age, in damaged, burned, or diseased forests, and in riparian areas. Priority snag and log habitat includes individual snags and/or logs, or groups of snags and/or logs of exceptional value to wildlife due to their scarcity or location in a particular landscape. Areas with abundant, well distributed snags and logs are also considered priority snag and log habitat. Examples include large, sturdy snags adjacent to open water, remnant snags in developed or urbanized settings, and areas with a relatively high density of snags.</p> <p><b>Criteria:</b> Comparatively high fish and wildlife density and species diversity, important fish and wildlife breeding habitat and seasonal ranges, limited availability, high vulnerability to habitat alteration, large number of cavity-dependent species.</p>
Talus	<ul style="list-style-type: none"> <li>• Homogenous areas of rock rubble ranging in average size 0.15 – 2.0 m (0.5 – 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.</li> </ul> <p><b>Criteria:</b> Limited availability, unique and dependent species, high vulnerability to habitat alteration.</p>
Urban Natural Open Space	<ul style="list-style-type: none"> <li>• A priority species resides within or is adjacent to the open space and uses it for breeding and/or regular feeding; and/or the open space functions as a corridor connecting other <i>priority habitats</i>, especially those that would otherwise be isolated; and/or the open space is an isolated remnant of natural habitat larger than 4 ha (10 acres) and is surrounded by urban development. Local considerations may be given to open space areas smaller than 4 ha (10 acres).</li> </ul> <p><b>Criteria:</b> Comparatively high fish and wildlife density, high fish and wildlife species diversity, important fish and wildlife breeding habitat, important fish and wildlife movement corridors, limited availability, high vulnerability to habitat alteration.</p>
Vegetated Marine/ Estuarine	<p>Includes vegetated areas in the intertidal and subtidal zones to a depth of approximately 30.5 m (100 ft) below mean lower, low water (MLLW).</p> <ul style="list-style-type: none"> <li>• Eelgrass meadows: Habitats consisting of intertidal and shallow subtidal shores which are colonized by rooted vascular angiosperms of the genus <i>Zostera</i>.</li> </ul>

	<ul style="list-style-type: none"> <li>• Kelp beds: Patches of sedentary floating aquatic vegetation of the genus <i>Macrocystis</i> and/or <i>Nereocystis</i>.</li> <li>• Turf algae: Habitats consisting of non-emergent green, red, and/or brown algae plants growing on solid substrates (rocks, shell hardpan).</li> </ul> <p>Criteria: Comparatively high fish and wildlife density, high fish and wildlife species diversity, important fish and wildlife seasonal ranges, limited availability, high vulnerability to habitat alteration, dependent species.</p>
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3. Naturally occurring ponds under 20 acres and their submerged aquatic beds provide fish and wildlife habitat/lakes, ponds, streams and rivers planted with game fish by a governmental or tribal entity:

Some of these areas are currently designated and protected under the City of Lacey's Wetland Protection Ordinance. The Wetland Protection Ordinance covers wetland areas that do not fall under the jurisdiction of the Shoreline Master Program. However, for the purposes of habitat protection, they have also been designated and regulated under standards for Fish and Wildlife Conservation areas as the Wetland Protection Ordinance does not provide specific recommendations concerning the priority habitat and species requirements.

4. Commercial and recreation shellfish areas and kelp and eelgrass beds:

The City of Lacey does not have any marine beachfront property under its jurisdiction or in its urban growth area that would have any shellfish areas or kelp or eelgrass beds with the exception of the Nisqually bluff area. This area is designated as a shoreline of the State and is regulated by the Shoreline Master Program. It is also be designated as a Fish and Wildlife Conservation area.

5. Waters of the State:

Regarding waters of the state, these areas are already regulated under the Shoreline Master Program. However, standards of the Shoreline Master Program do not deal with specific habitat and species concerns. Such areas are also designated as Fish and Wildlife Habitat Conservation areas.

6. State and natural area preserves and natural resource conservation areas:

The City of Lacey does not have any State natural area preserves or natural resource conservation areas in the City of Lacey or within its urban growth area.

7. Methods of Protection: The Washington Department of Fish and Wildlife has provided specific criteria for priority habitat and priority species. This includes both information on designation, habitat areas, and areas known to have priority species. The City has had implementing legislation for the priority habitat and species program since 1992. Implementing legislation needs to be reviewed periodically to ensure it is adequately implementing protection of priority habitats and priority species in the Lacey area.

8. Anadromous fish and riparian habitat areas: Protection of anadromous fish and riparian habitat has become very important over the last decade. The State passed legislation requiring protection under RCW 36.70A.172. The department of Fish and Wildlife has produced specific standards for protection of these resources that need to be followed. Lacey only has one fish bearing stream; Woodland Creek. When Lacey adopted its GMA wetland regulations in 1992 it established a 200-foot setback requirement for Woodland creek. Most of Woodland Creek in Lacey and Lacey's growth area is considered a type 3 stream by DNR stream typing maps.

The Department of Fish and Wildlife has developed setbacks for riparian habitat. These standards are based upon best available science. Standards require a 250 foot setback for type 1 and 2 streams, 200 foot setback for type 3 streams or fish bearing streams between 5-20 feet wide, 150 foot setback for type 3 streams less than 5 feet wide and a 150 foot setback for class 4 and 5 streams with low mass wasting potential. The standards developed by the State correspond to setbacks adopted by Lacey in 1992 for type 3 streams the size of Woodland Creek; Type 3 streams are recommended to have a 200-foot setback. However, setbacks for other stream types recommended by the department, are wider than Lacey's 1992 standards

In addition to setbacks for protection of streams, emphasis has also recently been given to the health of the streams watershed. A study from the University of Washington looked at urban development

coverage, and forest coverage in watersheds in the Puget Sound area, and demonstrated that stream quality is significantly influenced by loss of tree cover with urbanization. Thurston Regional Planning recently completed two studies looking at land coverage, forest and vegetation coverage, and rate of urbanization and forest harvest within watersheds in Thurston County. This study shows the Woodland Creek watershed to have 21% urban cover, 30% forest cover, and 62% of its riparian cover. The percentage of riparian coverage and forest coverage for Woodland Creek is still considered good.

Considering these studies Woodland Creek is still relatively healthy considering potential for biotic integrity and water quality. From this standpoint, the 200 foot buffer Lacey has required along Woodland Creek since 1992 is justified in maintaining the streams health, and ability to support anadromous fish.

D. Conclusions

Based on the above analysis, the City has formulated the following conclusions:

1. Preservation of fish and wildlife habitat is critical to the protection of suitable environments for animal species and in providing a natural beauty and healthy quality of life for Lacey and its citizens.
2. The Washington Department of Fish and Wildlife (WDFW) has developed a program for designation of priority habitats and species with specific recommendations for protection that are currently utilized by the City of Lacey. Pursuant to WAC 365-195-910 (1) these recommendations published by WDFW and utilized by Lacey represent the best available science and meet requirements of RCW 36.70A.172.
3. Implementing legislation used by Lacey through the 1990's has protected priority habitats and species in the Lacey area.
4. The City should continue to support the Washington Department of Fish and Wildlife's priority habitats and species program.
5. Lacey has the chance to maintain the biotic integrity of Woodland Creek, if it is properly protected. As recommended by the Department of Fish and Wildlife, the 200-foot buffer Lacey began requiring along Woodland Creek in 1992 should be maintained. The City should continue to utilize the stream typing maps and setbacks recommended by the Department of Fish and Wildlife for riparian

habitat protection for type three streams, and should amend its habitat protection ordinance to adjust buffer widths for other stream types.

6. Protection of habitat and priority species is important and critical to the quality of life in Lacey. However, protection and management plans must be balanced with the necessity of urban land use activities for the urban growth area. As an example, it would not make sense, from the standpoint of the City's effort to urbanize and provide commercial services, to protect a small, isolated mixed oak/conifer stand with little urban habitat value in the middle of a commercially designated area. Particularly if protection of the total stand would prohibit use of the site in the intended capacity of the zone in which it is located. Instead, efforts could be made to incorporate the best oaks within the context of the site design, landscaping plan, required open space and buffers. This would work towards achieving a balance consistent with both habitat protection and urbanization. More significant stands located outside the urban growth areas that are not affected by urban style development should be encouraged to be preserved as part of this regions joint planning process.

E. Goals/Policies

1. Goal

To provide consideration, protection and effective management of Lacey's habitat conservation areas.

A. Policy

Pursuant to RCW 36.70A.172 and WAC 365-195-900 through 925, the City of Lacey shall utilize the best available science information and recommendations from the Washington Department of Fish and Wildlife in classifying and designating priority habitats and species.

B. Policy

The City shall continue to use legislation required under the Growth Management Act to provide regulation and protection of Lacey's priority habitats and species.

C. Policy

The City shall continue to utilize a classification system identified and developed by the Washington Department of Fish and Wildlife including protection for endangered, threatened and sensitive species as well as candidate, monitor, game/non-game and other wildlife.

D. Policy

Legislation shall continue to require utilization of established management practices as well as newly developed strategies in protection of priority habitats and species as recommended by the Washington Department of Fish and Wildlife.

E. Policy

Recognize GMA requirements for urbanization as well as habitat protection, particularly in commercial areas, and strive to balance these competing interests in the best interest of our community.

F. Policy

Based upon best available science, and recommendations of the Department of Fish and Wildlife, utilize stream typing maps and recommended buffer widths for stream corridors. Maintain the 200 foot buffer requirement along Woodland Creek and adjust standards for other stream types as recommended by the Department of Wildlife.

## V. GEOLOGICALLY SENSITIVE AREAS

### A. Primary Issues

1. Geologically hazardous areas are a risk to the public health and safety:

Geologically hazardous areas include those susceptible to erosion, sliding, earthquake, or other geological events and may pose a significant threat to the health and safety of the citizens when incompatible commercial, residential, or industrial development is sited in areas of significant hazard.

2. Some geological hazards can be reduced or mitigated:

Some geological hazards can be mitigated by proper engineering design or modified construction so that risks to health and safety are acceptable. However, when technology cannot reduce risk to acceptable levels, building in geologically hazardous areas should be avoided.

3. Growth Management Act Requirements:

The Growth Management Act recognizes the significant hazard to the public health and safety from geologically hazardous areas. The Growth Management Act requires jurisdictions to classify and designate geologically hazardous areas, including erosion hazard, landslide hazard, seismic hazard, and areas subject to other geological events. Regulations for these areas should be based upon best available science.

### B. Definitions Applicable to Geological Hazard Areas

1. Growth Management Act Definition of Geologically Hazardous Area:

The Growth Management Act defines geologically hazardous areas as "areas that because of their susceptibility to erosion, sliding, earthquake or other geological events, are not suited to the siting of commercial, residential, or industrial development consistent with public health or safety concerns."

2. Erosion Hazard Areas:

The Department of Trade and Economic Development's State Office of Community Development (OCD) minimum guidelines

define erosion hazard areas as “areas identified by the United States Department of Agriculture (USDA) Soil Conservation Service (SCS) as having a severe reil and interreil erosion hazard.”

3. Landslide Hazard Areas:

The ~~Department~~ Office of Community Development minimum guidelines defines landslide hazard areas as “areas potentially subject to landslides because of the combination of geologic, topographic, and hydrologic factors. These areas are typically susceptible to landslides because of a combination of factors, including bedrock, soil, slope gradient, slope aspect, geologic structure, groundwater, or other factors.

4. Seismic Hazard Areas:

The ~~Department~~ Office of Community Development minimum guidelines define seismic hazard areas as “areas subject to severe risk damage as a result of earthquake-induced groundshaking, slope failure, sediment or soil liquifaction.”

5. Volcanic Hazard Areas:

The ~~Department~~ Office of Community Development minimum guidelines define volcanic hazard areas as “areas subject to pyroclastic flows, lava flows, and inundation by debris flows, mud flows, or related flooding resulting from volcanic activity.”

C. Analysis/Methodology

1. Growth Management Act Requirements:

a) Hazard Areas Classified:

Pursuant to ~~Department~~ the Office of Community Development guidelines, the Growth Management Act requires governments to classify geologically hazardous areas. These areas should include areas that are susceptible to one or more of the following types of hazards:

- i) erosion hazard;
- ii) landslide hazard;
- iii) seismic hazard;
- iv) mine hazard;
- v) volcanic hazard; or



- vi) area subject to other geological events, including at a minimum: mass wasting, debris flows, rockfalls, and differential settlement.

b) Description of Risk:

In addition to identifying and classifying such areas, it is necessary to determine which areas should be prohibited, restricted, or otherwise controlled because of the danger from the geologic hazard. ~~Department~~ Office of Community Development recommends that jurisdictions classify geologically hazardous areas according to either:

- i) Known or suspected risk;
- ii) No risk; or
- iii) Risk unknown, where data is not available to determine the presence or absence of a geological hazard.

2. Erosion Hazard Areas:

The ~~Department~~ Office of Community Development recommends reviewing Soil Conservation Service soil maps in determining erosion hazard. Soil data for Thurston County is available from the Soil Conservation Service in the form of a report titled "Soil Survey of Thurston County Washington" dated June, 1990.

Review of soil types and soil characteristics prevalent in the City of Lacey and Lacey's urban growth area indicates that there are six soils with at least moderate limitations considering erosion hazard. Table 11 lists these soils, slope, and erosion hazard potential. A map showing more specific locations of these soils is shown as Map 11, Geologically Sensitive Areas.

Review of the map indicates that primary areas of concern are found in the Woodland Creek area north of I-5 and around the southern ends of Long Lake and Hicks Lake. Slopes in these areas can run as high as 15-30% and have a moderate erosion hazard.

The only severe area considering slope and erosion hazard is found in the Nisqually Bluff area which is at the northernmost extremity of Lacey's urban growth area. The Nisqually Bluff area is characterized with a slope of 60-90% with a severe erosion hazard potential. United States Geological Service maps also list this area as a geologically sensitive area with severe erosion potential.

Most of these areas within the City of Lacey can probably have erosion hazards overcome by proper engineering and drainage control during development. These areas should be designated for potential concern and should require an analysis at the time of development application.

Table 11

Soils in Lacey and Lacey Growth Area  
with Moderate or Severe Erosion Hazards  
Composed from information contained in the SCS Soil Survey for Thurston  
County.

SCS #	SOIL NAME	SLOPE	EROSION HAZARD
3	Alderwood gravelly sandy loam	15-30%	Moderate
30	Dystric Xerochrepts	60-90%	Severe
34	Everett very gravelly sandy loam	15-30%	Moderate
40	Giles sandy loam	15-30%	Moderate
43	Hoogdal sandy loam	15-30%	Moderate
48	Indianola loamy sand	15-30%	Moderate

3. Landslide Potential:

a. Department Office of Community Development Minimum Guidelines: The Department Office of Community Development lists a number of elements that must be considered in determining areas with a geological hazard regarding landslide potential. These include:

- i. Areas of historic failure;
- ii. Areas with a combination of the following three characteristics: (1) slopes steeper than 15%; (2) hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock; (3) springs or groundwater seepage;
- iii. Areas that have shown movement during the Holocene Epic (from 10,000 years ago to the present) or which are underlain or covered by a mass wastage debris of that epic;

- iv. Slopes that are parallel or sub-parallel to plains of weakness (such as bedding plains, joint systems and fault plains) in sub-surface materials;
- v. Slopes having gradient deeper than 80% that are subject to rockfall during seismic shaking;
- vi. Slopes potentially unstable as a result of rapid stream incision, stream bank erosion, or undercutting by wave action;
- vii. Areas that show evidence of or are at risk from snow avalanches;
- viii. Areas located in a canyon or on an active alluvial fan presently or potentially subject to inundation by debris, flows, or catastrophic flooding;
- ix. Any area with a slope of 40% or greater with a vertical relief of 10 or more feet except areas composed of consolidated rock.

b. Areas of Historic Failure:

The ~~Department~~ Office of Community Development suggests reviewing soil records from the Soil Conservation Service as having been classified as severe limitation for building site development in locating areas subject to landslide. Additionally, the Department of Ecology coastal zone atlas and USGS and Department of Natural Resources maps designate some slide hazard areas.

Review of Soil Conservation Service material from the Soil Survey for Thurston County Washington shows 6 soils in the City of Lacey with severe limitations considering development due to steep slopes. Table 12 lists soils found in the City of Lacey or Lacey's urban growth area with development limitations related to slopes. Map 6 shows the location of those soils. Review of the soils table and map indicate that the six soils showing severe limitations also correspond to those soils listed in the erosion hazards soil table, Table 11. These areas are generally concentrated in the Woodland Creek area north of I-5 and around the southern portions of Hicks and Long Lakes and the Nisqually Bluff area.

These limitations regarding slope stability may be able to be overcome with proper engineering. The areas with severe limitations should be designated as environmentally sensitive for slope stability problems and requirements should be developed for analysis and standards to be applied at the time development applications are submitted for these properties.

Review of the Department of Ecology's coastal zone atlas and the USGS geological survey maps for the area indicate that the Nisqually Bluff area is designated for slope hazard.

Table 12

**SOILS WITH DEVELOPMENT LIMITATIONS**

Soils in Lacey and Lacey's Growth Area that have development limitations because of steep slopes. Composed from information contained in the SCS Soil Survey for Thurston County

SCS #	SOIL NAME	SLOPE	EROSION HAZARD
3	Alderwood gravelly sandy loam	15-30%	Severe
30	Dystric Xerochrepts	60-90%	Severe
34	Everett very gravelly sandy loam	15-30%	Severe
40	Giles sandy loam	15-30%	Severe
43	Hoogdal sandy loam	15-30%	Severe
48	Indianola loamy sand	15-30%	Severe

- c. Areas with a combination of slopes steeper than 15%, hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock and springs or groundwater seepage:

The combination of a slope, a permeable sediment layer overlying a relatively impermeable layer, and a perched groundwater, can result in a landslide. Therefore, to identify slope hazard areas, these three characteristics should be investigated. Slopes greater than 15% in the City of Lacey and Lacey's urban growth area have been identified in Tables 11 and 12. Currently, no data is available for hillsides intersecting geologic contacts or groundwater seepage areas. Therefore, these features should be acknowledged and reviewed on a case-by-case basis as

development projects are reviewed to determine if the three characteristics at a specific site produce a geologic hazard.

- d. Areas that have shown movement during the Holocene Epic or which are underlain or covered by mass wastage debris of that epic:

Areas with obvious landslide features and historic landslides fit into that category. The only such area in Lacey or Lacey's urban growth area identified as such is the Nisqually Bluff area. This area is identified both on the USGS and the State Department of Ecology coastal zone atlas as a landslide hazard area.

- e. Slopes that are parallel or sub-parallel to points of weakness in sub-surface materials:

Currently, no data is available for the City of Lacey or Lacey's urban growth area relative to this element. As suggested by the Department Office of Community Development, field studies are the best source of information for the presence of these conditions.

- f. Slopes having gradient steeper than 80% that are subject to rock fall during seismic shaking:

The only area within the City of Lacey or Lacey's urban growth area that exhibits this characteristic is the Nisqually Bluff area that is designated both on the USGS maps and the Department of Ecology's coastal zone atlas.

- g. Slopes potentially unstable as a result of rapid stream incision, stream bank erosion, or undercutting by wave action:

The only obvious area in Lacey or Lacey's urban growth area that exhibits this characteristic is the Nisqually Bluff area shown in the Department of Ecology's coastal zone atlas and the USGS maps. Additionally, it is possible that some areas along the Woodland Creek corridor in Lacey's urban growth area may exhibit this characteristic. Map 6 shows soils with slopes that may exhibit erosion hazard, including areas along Woodland Creek and Nisqually bluff.

- h. Areas that show evidence of or are at risk from snow avalanches:

No areas in the City of Lacey are subject to this risk.

- i. Areas located in a canyon or on an active alluvial fan presently or potentially subject to inundation by debris, flows or catastrophic flooding:

There are no areas in the City of Lacey subject to this element.

- j. Any area with a slope of 40% or greater and with a vertical relief of ten or more feet except areas composed of consolidated bedrock:

The only area in the City of Lacey or Lacey's urban growth area meeting this criteria is the Nisqually Bluff area, which is mapped on the coastal zone atlas and USGS map.

4. Seismic Hazard areas:

The City of Lacey is identified in the Uniform Building Code as being located within a Zone 3 seismic zone. Seismic zones are classified from 0-4, 0 being the lowest and 4 being the highest. The City of Lacey is therefore within a zone showing significant risk regarding earthquake hazard. Discussion with Department of Natural Resources staff in the geology section indicates that a special study has been done for the Olympia area, showing those areas more susceptible to earthquake damage than others. This study appeared in the bulletin of the Seismological Society of America, Volume 80, October, 1990, No. 5, and was titled "Seismic Ground Response Studies in Olympia, Washington and Vicinity."

This study states that the Pacific Northwest cities of Seattle, Tacoma, and Olympia are urban centers at significant risk from the occurrence of large earthquakes. The study discusses ground motion modeling, with an objective to produce maps of ground-shaking hazard. This partially relies on method for predicting relative ground response associated with fibratory motion from an earthquake. Relative ground response is the amplification of the ground motion at a site relative to ground motion at a reference site. Amplification is usually due to geologic conditions underlying a specific site.

The study states that it is desirable to make extrapolations of ground response in the areas where ground motion data may not be available to be used for probabilistic risk assessments of the

entire urban area. The geophysical studies described in the report were designed to provide relative ground response values determined from observed seismological data and to indicate those correlations of ground response with other known parameters that could assist in making the extrapolations. The study used a ground response function (grf) as a measure of amplification of seismic waves by localized site conditions.

The study found that typically, the grf values related well with surficial geological units. The study concluded that the observed spatial distribution of the grf values was not random and was probably due to shallow geotechnical and geologic causes. The study cautions that observations must be tempered by the fact that surficial geology has not been mapped in detail in the area of some of the sites, and neither the thickness nor the shear velocities of the geologic units are known at this time, and are therefore not factored into the data. As such, the study does not provide the type of definitive answers that would be needed to make a more precise delineation of earthquake hazard sites in the Lacey area. Such data could only come from specific site by site investigations.

Currently, the City of Lacey has specific standards in the Uniform Building Code that are enforced in a seismic 3 zone.

5. Volcanic hazard area:

While the City may be impacted by ash from surrounding known volcano sites, the City of Lacey is not listed as being in an area subject to pyroclastic flows, lava flows, and inundation by debris flows, mud flows or related flooding resulting from volcanic activity.

D. Conclusions

Based on the above analysis, the City has formulated the following conclusions:

1. Certain areas subject to erosion or landslide hazard may present a risk to person and property. It is important to have such areas designated and specific requirements for analysis and compliance with standards at such time as development activity is proposed on such sites. Identification of areas in the Lacey growth area has been accomplished with best available science, using information from a variety of state agencies with expertise in this field.
2. The City of Lacey is in an area considered at significant risk for seismic hazards. It is important to ensure standards in the Uniform

Building Code and requirements for special analysis are required in review of development proposals.

3. There is no risk from volcanic activity in the City of Lacey.

E. Goals/Policies

1. Goal

To designate and regulate development on lands having identified geologic hazards to protect the health and safety of persons and property and to avoid other adverse impacts of erosion, landslide and other geologic hazard.

- A. Policy

Develop implementing legislation, based upon best available science, with specific requirements for analysis of geologically sensitive areas and application of specific development standards to prevent erosion and landslide hazard.

- B. Policy

The City will continue to gather and review seismic hazard data for the area to better assess specific seismic hazard areas (those areas more sensitive than others because of geological parameters). The City will consider development of additional requirements associated with Uniform Building Code review to buildings in Lacey's most sensitive earthquake hazard areas.



IV. AQUIFER PROTECTION AREAS

A. Primary Issues

1. Northern Thurston County's aquifers are the sole source of drinking water for over 105,000 people:

Groundwater protection is a particular concern in Thurston County, as nearly 100% of the County's domestic, industrial, and agricultural water supplies rely on groundwater. Local governments throughout Thurston County have been asked to solve a complex collection of new water quality protection problems, resulting from increased population and land use pressures.

2. The hydrogeology of northern Thurston County indicates it is susceptible to contamination:

Many of the surface deposits are sands and gravels that water and contaminants can move through easily. In addition, the water table is close to the surface in places and in some areas there are few soil and subsurface particles that contaminants can bind to easily. Also, in many areas there are no confining layers between higher and lower aquifers, so all of the aquifers are considered vulnerable. The degree of susceptibility varies throughout the groundwater area, depending on the specific geologic characteristics of the sub-area.

3. Susceptibility alone will not result in contamination:

A contaminate source also must be present to pollute groundwater. Unfortunately, in our increasingly complex society there are numerous substances that may threaten human health or other species and a multitude of sources for those contaminants.

4. Cost of clean-up of contaminated groundwater may be prohibitive:

Once groundwater is contaminated, it is difficult, if not impossible, to clean up; and the cost of cleaning groundwater may be prohibitive. Protection of groundwater sources and prevention of contamination is the most reasonable alternative in protection of groundwater resources.

5. Protection of the aquifer may have significant impacts on land use distribution and allowed uses in protected areas:

Designation of aquifer sensitive areas and wellhead protection areas and regulation of land uses within those areas may have significant impact on what land uses are allowed in sensitive areas and what type of land use controls are required within those areas. Because many of Lacey's existing wells are in areas that are already developed, application of standards required to protect groundwater may have significant impact on the operation for existing uses. Consideration needs to be given to how groundwater protection is accomplished to provide fair and equitable treatment in the legislation of groundwater protection.

6. Aquifer protection requires interjurisdictional cooperation:

Mapping of aquifers underlying Thurston County show that aquifers and sensitive areas do not follow jurisdictional boundaries. Sensitive areas cross jurisdictional boundaries and interjurisdictional cooperation is necessary to adequately protect aquifer resources.

7. In 1987, the County petitioned the Department of Ecology to form a groundwater management area for the northern part of Thurston County:

The Thurston County area received priority designation as a groundwater management area in July of 1987. A Groundwater Advisory Committee was established, consisting of a broad cross-section of interests and has been responsible for overseeing the development of a groundwater management plan. A draft groundwater management plan has been circulated and is intended to be a comprehensive plan for managing groundwater in north Thurston County.

8. Federal Drinking Water Act Requirements:

Provisions under the Federal Drinking Water Act require states to develop requirements for wellhead protection. The State Department of Health is currently developing these requirements that will require water purveyors to develop wellhead protection programs.

9. The Growth Management Act recognizes the importance of water resources in the protection of aquifers that satisfy water needs:

The Growth Management Act requires jurisdictions to identify and protect sensitive aquifer recharge areas. Protection efforts shall be based upon best available science.

B. Definitions Applicable to Aquifer Protection

1. The Growth Management Act defines a critical area in regard to aquifer protection as: "areas with a critical recharging effect on aquifers used for potable water."

C. Analysis/Methodology

1. Growth Management Act Requirements:

The Growth Management Act requires that all counties and cities classify, designate and regulate to preclude incompatible uses in "areas with critical recharging effect on aquifers used for potable water." In addition, it requires the use of best available science in development of protection measures.

According to the Department of Community Development minimum guidelines, if an area is designated as a sole source aquifer by the U.S. Environmental Protection Agency or a groundwater management area (GWMA) by the Department of Ecology, then you have met the intent of the classification requirement for aquifer recharge areas. In 1987, the County petitioned the Department of Ecology to form a groundwater management area for the northern part of Thurston County and such designation received approval that same year.

According to the Department of Community Development, to determine the susceptibility of the aquifer, the following characteristics should be reviewed:

- a) depth to groundwater;
- b) aquifer property, such as hydraulic conductivity and gradients;
- c) soil texture, permeability, and contaminate attenuation properties;
- d) characteristics of the vadose zone (the unsaturated top layer of soil and geologic material), including permeability and attenuation properties; and
- e) other relevant factors.

The Department of Community Development minimum guidelines further recommend that to evaluate contaminate loading potential, the following factors should be considered:

- a) general land use;
- b) waste disposal sites;
- c) aquifer activities;
- d) results from well logs and water quality test results; and
- e) any other information about the potential for contamination.

2. Groundwater Advisory Committee Groundwater Management Plan:

Extensive research into the area of aquifer sensitivity in northern Thurston County has been accomplished by the U.S. Geological Survey and the Thurston County Health Department. The Northern Thurston County Groundwater Management Plan, developed by the groundwater Advisory Committee, characterizes the plan area, including Lacey and Lacey's growth area, the area's hydrology, the groundwater quality of the area, the quantity of groundwater recharge and groundwater use, discusses groundwater protection issues and goals for groundwater protection, and provides specific groundwater protection recommendations. A summary of this work is provided below.

- a) Area characterization: The area of northern Thurston County, which has been designated as a groundwater management area, comprises the northern third of Thurston County. The area includes a total of 232 square miles. Vertically, the groundwater management area extends through several aquifer layers to bedrock, as all of these layers are used to provide the drinking water of Thurston County. The groundwater management area boundaries were set with the goal of protecting the entire groundwater system within the hydrogeologic boundaries of the northern Thurston County region.
- b) Topography: The County is generally a region of prairies and rolling lowlands broken by minor hills and a few peaks which rise to elevations of about 2600 feet. The prairies formed by glacial outwash plains underlain by sands and

gravels present level to rolling terrain that slopes northward to the Puget Sound shoreline. The prairies are marked by a number of kettle depressions left by melting glacial ice, and now containing lakes, ponds and sloughs. Alluvial bottomlands are found near the Deschutes, Nisqually, and Black Rivers. Streams such as McAllister, Woodland, Woodard, Salmon, Spurgeon and Eaton Creeks are also associated with significant low-lying wetlands.

- b) Climate: The climate in Thurston County is influenced by the same weather patterns that affect other areas of the Puget Sound. Moderate year-round temperatures are influenced by moist Pacific airflows, characterized by heavy rainfall in late fall and winter months and dry summer weather. The average annual rainfall in Olympia is 51 inches. 79% of the precipitation at Olympia falls in the six-month period October through March.
  
- d) Population and Land Use: In the 1960's with the growth of State Government and opening of Evergreen State College, Thurston County's population exploded. Population increases during the 1960-1970 and 1970-1980 periods were 40% and 62% respectively. Between 1980 and 1990, Thurston County grew 30%, making Thurston County the fifth fastest-growing county in the State. In the 1980's, 70% of the population growth occurred in unincorporated areas. ~~Today,~~ The 2000 census estimated the population of Thurston County is at ~~161,800~~ 207,355, with the majority, ~~approximately 115,000 people,~~ living within the northern third of the County that comprises the groundwater management area. The three cities of Olympia, Lacey, and Tumwater comprise 93% of the total incorporated population.

Using the median growth scenario based on current growth rates, Thurston Regional Planning Council has forecasted population through the year ~~2040~~ 2025, and estimates the population for the County will grow ~~by 66% between 1990 and 2040,~~ to a total of ~~268,588~~ 334,260 by this date.

- e) Groundwater uses: Essentially all of the water used for drinking and other purposes in Thurston County is supplied by groundwater. There are over 1200 public water supplies in Thurston County, and all of these use groundwater sources. The picture is one of total dependence on groundwater for drinking water, industrial processing water, irrigation, and aquaculture. All of these uses require high

quality water, which is available in abundance in most parts of the groundwater management area. Groundwater is also a primary source of dry season stream flows in the county, and is therefore important to the ecology, fisheries, and recreation opportunities in the county.

- f) Area geology: The geology and land forms of Thurston County are largely the result of glacial action during the ice age that lasted from two million years ago to ten thousand years ago, known as the Pleistocene Epic. This ice age period caused glaciers, now found only in high mountainous areas, to grow and move downward. These valley glaciers joined into huge continental glaciers that were thousands of feet thick. At their maximum advance, the glaciers extended to Scatter Creek south of Olympia and to the Deschutes River in eastern Thurston County. Glaciers advanced and retreated four times during the Ice Age, with the last advance referred to as the Vashon Glaciation.

As the glaciers moved southward from British Columbia, they gouged and scoured the land beneath them and picked up large amounts of sediment, ranging from boulders to silt. Friction of movement caused the melting of the glacier's base, resulting in some of the sediment load being deposited as a compressed layer directly below the glacier. This formed the dense, generally impermeable material known as a glacial till. As the glacier melted, the waters that flowed off it carried large amounts of silt, sand and gravel. Coarser materials were deposited close to the glacier's edge, while sands were carried farther and deposited on the flood plains. Silt and clay were deposited mainly in lakes and marine waters.

After the glaciers melted, large remnant ice blocks were left on the outwash plains. These blocks were covered by younger sediments that later subsided into voids left by the melted ice blocks, forming the numerous kettle lakes of the county.

The sediments deposited by these events are grouped into seven major geological units, representing the older bedrock and deposits from two glacial advances. Some of these units are aquifers, meaning they can provide water to wells or springs in usable quantities. Other fine-grained silt, clay, or hardpan layers are aquitards, restrictive layers, which means they slow or restrict the passage of water.

The most recent aquifer, the Vashon recessional outwash, consists of sand and gravel layers deposited by streams from the melting of the most recent glacial period. This unit averages 25 feet in thickness and is the source of water for many shallow wells. Because it is so close to the surface, the aquifer is also relatively vulnerable to contamination.

The Vashon Till lies below the Vashon recessional outwash. The Vashon Till was deposited directly under the glacier under high pressure and is an unsorted mixture of sand, gravel, and boulders in a compact matrix of silt and clay. The Vashon Till generally has a low permeability, which makes it unsuitable as an aquifer in most cases. A typical thickness for this unit is 40 feet thick, but can range from several feet to 175 feet in thickness.

The Vashon Advance Outwash is the third major geologic unit. It consists of layers of stratified sand and gravel deposited by glacial meltwaters at the front and sides of the advancing glacier. The advance outwash is typically 30 feet thick, but can reach as much as 135 feet thick.

The Kitsap formation underlies the Vashon advance outwash. This unit contains layers of clay and silt, with scattered thinner layers of sand, gravel and peat. It is generally about 55 feet thick, but locally is up to 150 feet thick. This is an unimportant aquifer in Thurston County, since it is relatively impermeable; however, it does play a significant part in the occurrence of groundwater underlying the peninsular area and northernmost prairie area in that it confines water in the underlying formation at some places and gives it a slight artesian head. In other areas, the Kitsap formation effectively retards the downward percolation of water, causing storage of large volumes of water in the overlying deposits of the Vashon advance.

The penultimate drift, formerly believed to be part of the Salmon Springs Drift, is a significant aquifer that averages 30 feet in thickness and can range up to 220 feet thick. Below the penultimate drift are undifferentiated deposits. Very little information exists on these deposits. According to well drillers' reports of the few wells finished in this unit show a sequence of unconsolidated clays, silts, sand and gravel.

The Tertiary bedrock unit is the lowest and oldest geologic unit found in Thurston County. This unit consists of sandstones with interbedded silt stone layers deposited during the tertiary period.

The above described geologic units complete the geologic sequence in the area, but it should be mentioned that not all units are present in all parts of the groundwater management area. The layers are not uniform, either in thickness or in composition, and may have interbedded layers of different composition. Layers may also have become tilted due to past geologic events.

- g) Hydrogeology of groundwater management area: The U.S. Geological Survey estimates that there are approximately 6500 wells in the groundwater management area. The USGS study inventoried over 1300 wells and used geologic information from about 1220 wells. Additional information was available from 2,156 wells from an earlier geological survey.

A table has been developed to describe characteristics of the major aquifers of northern Thurston County. This table is shown as Table 10. This table shows aquifer permeability which is described by hydraulic conductivity and is defined as the discharge through a one foot square area of water with hydraulic gradient of 1.

Groundwater flow is usually determined from water levels in wells. The water level elevations are measured and used to construct water level contour maps. Groundwater flows vertically as well as horizontally within aquifers, and vertical flow can cause water to flow from one aquifer down into an underlying aquifer. This is one of the ways in which lower aquifers become recharged.

Water level data has been compiled by the USGS for two main aquifers: the Vashon Advance and the Penultimate Glaciation aquifers. This information shows that groundwater in northern Thurston County generally moves horizontally to the marine shorelines and to major surface drainage channels. Beneath the upland areas, water also flows vertically from the Vashon Advance aquifer through the Kitsap Formation and into the Penultimate Glaciation unit. Near marine shorelines and major drainage channels, groundwater commonly moves vertically upward and in



these areas flowing artesian wells are common. Groundwater flow directions are very important and helpful in understanding the behavior of groundwater contaminants. Dissolved contaminants move in the same direction as the groundwater flow.

- h) Groundwater recharge: The process of replacing water within aquifers is called recharge. Recharge can occur from rainfall, from horizontal or vertical movement from one aquifer to another, or by movement into the ground below streams and lakes.

According to studies, the groundwater management area contains a fairly distinct and hydraulically isolated mass of groundwater. The groundwater system does not receive water from the Cascade or Olympic Mountains or other distant locations. While streams and lakes provide a significant amount of groundwater recharge, rainfall is by far the primary source of water for the replenishment of the aquifer system. Most groundwater recharge from precipitation occurs during the months of October through March, when precipitation greatly exceeds evapotranspiration. As might be expected, the relative amount of precipitation that becomes groundwater recharge varies from place to place, depending upon soil characteristics and drainage patterns. USGS study estimates that the groundwater system under the groundwater management area receives an average of approximately 25 inches of recharge per year.

As rainfall infiltrates into the ground, it can potentially mobilize and carry with it contaminants deposited on or within the ground. Controlling the sources of contamination within the groundwater management area is therefore important to protecting the water quality of the area's groundwater resources.

Table 10

Characteristics of the Major Aquifers of Northern Thurston County

Unit Label	Unit Name	Typical Thickness	*Percent of wells	Composition	Hydrologic Characteristics	Hydraulic Conductivity		
						#	Range	Median
Qvr	Vashon Recessional Outwash	25	4 5	Moderately to well sorted sand and gravel	An aquifer when saturated, mostly unconfined, locally perched conditions.	9	6 15-915	35 8
Qvt	Vashon Till	40	7 8	Compact, unsorted, sand and gravel in a matrix of silt and clay Some thin lenses of clean sand and gravel	Confining bed, but can yield useable amounts of water	16	4 81-663	47 9
Qva	Vashon Advance Outwash	30	29 4	Poorly to moderately well sorted and rounded gravel in a matrix of sand Some sand lenses	Principal aquifer, mostly unconfined Used extensively for public supplies near Tumwater	73	3 21-6,970	46 7
Qf	Kitsap Formation	55	9 8	Mainly silt and clay, with some layers of sand and gravel Minor peat layers.	Confining bed, but can yield useable amounts of water	17	3 61-2,020	31.8
Qc	Deposits of Penultimate Glaciation	30	28 6	Coarse sand and gravel, stained with red or brown iron oxides	Principal aquifer, confined Used extensively for industrial uses near Tumwater	77	2 54-5,260	59 0
TQu	Unconsolidated and Undifferentiated Deposits	--	14 0	Various layers of clay, silt, sand, and gravel of glacial and nonglacial origin	Contains both aquifers and confining beds Ground water probably confined Few wells	50	3 74-2,680	34.1
Tb	Tertiary Bedrock	--	5 9	Claystone, siltstone, sandstone, and minor coal beds Local bodies of andesite and basalt	Locally an aquifer, but generally unreliable Small well yields from fractures and joints.	--	--	---

\*percentage of these wells examined by the U S G S

Information provided by the Thurston County Health Department and documents prepared by the Ground Water Advisory Committee

Recharge of aquifers deeper than the initial water table aquifer also originates with the infiltration of precipitation, but the deep aquifers must receive this recharge by vertical leakage between geologic units (windows) into the aquifer formed by gaps in higher confining layers and lateral flow from areas with higher groundwater elevations.

Topography also affects recharge. Areas with flat topography receive more recharge than sloping areas because the rainfall has time to sink in rather than immediately running off down slope. Vegetation also helps increase recharge and reduce runoff by helping hold the water in place.

Artificial recharge can contribute water to the groundwater system also, such as irrigation, septic drainfields, dammed lakes and ponds and wastewater percolation facilities. Septic system drainfields are a source of aquifer recharge because they replace much of the water withdrawn from the aquifer by wells.

- i) **Groundwater Discharge:** Groundwater discharge is flow out of the aquifer which can occur as seepage to lakes, streams, and rainwaters, spring flow, transpiration by plants, and withdrawals from wells. Artificial groundwater discharge occurs by pumping from wells or by allowing wells to flow. The USGS study estimates that 22,500 acre feet of water is withdrawn from wells in the groundwater management area, and 15,900 acre feet of spring water is put to beneficial use. This is equal to approximately 12% of the total recharge to the groundwater management area.
- j) **Sensitive Aquifer Areas:** Groundwater in certain areas is most easily impacted by surface activities because of natural features that make them more susceptible. The U.S. Environmental Protection Agency and the National Water Well Association have developed a nationally standardized system for rating groundwater susceptibility. This system is known as "DRASTIC," an acronym for the elements the system incorporates. These elements are described below.
  - i) **D – Depth to groundwater.** The closer the groundwater is to the source of pollution, the greater the potential for aquifer contamination. Depth to groundwater is given the highest weighting in determining relative susceptibility.

- ii) R – Net recharge. Recharge is determined from topography, soils and rainfall. Zones of high recharge are susceptible to contamination, since contaminants can potentially be transported along with the recharge water.
- iii) A – Aquifer media. The type of geologic material found within the aquifer affects the rate of movement of groundwater and the possible transport of contaminants.
- iv) S – Soil media. Many types of contaminants can be filtered or absorbed by the silts and clays found in fine-textured soils. Coarser soils have less potential for treating contaminants than finer soils.
- v) T – Topography. Sloping ground permits less surface infiltration than level ground.
- vi) I – Impact of Vadose zone media. The Vadose zone is the deeper soil areas that are saturated with water, but are above the actual water table.
- vii) C – Hydraulic conductivity of the aquifer. This is a measure of how readily an aquifer collects and transmits water and of the rate of movement of dissolved contaminants.

The Thurston County Health Department prepared a similar type of map primarily based upon 1990 soil service and geological information. This map is shown as Map 5. As can be seen from these maps, the areas of the highest sensitivity in Lacey are surrounding Lacey's lakes, including Hicks, Long, and Pattison Lake.

- k) Groundwater Quality: The first detailed examination of groundwater quality in Thurston County was the U.S. Geological Survey Study conducted in 1960. This study sampled 210 wells and found no chemical constituent concentrations that would be adverse to any domestic or irrigation water users in the county. The amount of groundwater quality data increased in 1974 when the regular public water system sampling became mandatory under uses and activities would be controlled, depending on the potential for impacting of such areas.

A regional interlocal technical committee established by interlocal agreement ~~will be responsible for~~ developing recommended minimum guidelines for wellhead protection. Each utility serving over 1000 connections, in cooperation with the local jurisdiction, would be responsible for establishing wellhead protection areas and wellhead protection programs for their own wellfields. The utilities will develop these programs in accordance with minimum guidelines established by the regional interlocal technical committee established by interlocal agreement. Programs will be subject to approval of the interlocal committee. Where wellhead protection areas cross jurisdictional boundaries, or are located in a different jurisdiction from the population they serve, the utility will work jointly with all affected jurisdictions in developing the program.

For Wellhead Protection Areas (WHPAs) that are part of systems that serve over 1000 connections, the regional committee ~~would~~ developed the following concepts as ~~when~~ developing minimum guidelines.

- i) Establishment of four primary zones with varying management strategies for pollution prevention.
- ii) Zone 1-A would be equivalent to the currently defined 100 foot protective radius as defined by State law. This area requires tight controls to reduce the possibility of surface flows reaching the wellhead and traveling down the casing.
- iii) Zone 1, the emergency response zone, ~~would encompass~~ encompasses the area within a 1 year time of travel (TOT) of a well, ~~with requirements for ground water monitoring at the perimeter and/or within the zone.~~

~~Policies/minimum guidelines applicable in Zone 1-2 would be were designed to reduce the risk of ground water contamination from human activities.~~

~~Parks and low density residential would be preferred land uses. They could be permitted after staff review.~~

~~No new businesses included in the Hazardous Materials program established by the regional committee would be allowed in the emergency response zone. All existing businesses would be required to retrofit their facilities to provide secondary~~

~~containment (if not already required), maintain an inventory of hazardous materials, and develop an approved plan for spill response and notification procedures. They would also be required to develop a training program for their employees. For high risk businesses it might also be appropriate to require industry monitoring of ground water or to phase out a business over an extended time period. In some cases the jurisdiction might choose to provide low interest loans to the businesses to retrofit their facilities.~~

~~A waiver or variance procedure would be developed to allow businesses to remain/locate in Zone 1 that could demonstrate they did not use, handle, or store the hazardous materials or could demonstrate they did not pose a risk to the groundwater resource.~~

- iv) Zone 2 would be an "intensive risk management zone." This would be the zone within the 1-5 year time of travel (TOT).

~~Management policies/minimum guidelines would be have been established for this zone designed to maintain or reduce the risk of ground water contamination from human activities.~~

~~New high risk businesses would not be allowed in the intensive risk management zone. Existing high risk businesses would be required to retrofit their facilities to provide secondary containment (if not already required), maintain an inventory of hazardous materials, and develop an approved plan for spill response and notification procedures. They would also be required to develop a training program for their employees. In some cases, it might also be appropriate to require industry monitoring of ground water or to provide low interest loans to the businesses to retrofit their facilities. In some cases, the jurisdiction might choose to phase out a business over an extended time period.~~

~~A waiver or variance procedure would be developed to allow businesses to remain/locate in Zone 3 that~~

~~were on the "high risk" list but could demonstrate they were not high risk because they did not use, handle, or store the hazardous materials generally associated with such a business.~~

- v) Zone 3, the zone within the 5-10 year time of travel (TOT) was ~~would be~~ established as an expanded risk management zone.

~~Management policies/minimum guidelines were would be established for this zone designed to maintain or reduce the risk of ground water contamination from man's activities.~~

~~New high risk businesses would be encouraged to locate outside of this area. Existing high risk businesses, and new high risk businesses that choose to locate in the area would be subject to additional source controls, and requirements similar to the requirements for existing high risk businesses in Zone 3.~~

~~It is intended that criteria will be developed classifying hazardous uses normally requiring source control requirements. If a business can show that it does not properly fall into a hazardous category, it may apply for a waiver or variance allowing less stringent source controls more appropriate for the particular use.~~

A buffer zone would include the remainder of the zone of contribution. The goal of this zone would be to provide information to planners on potential sources outside the Wellhead Protection Areas (WHPAs) which have the potential for releasing contaminants into the WHPA. Analysis may show the need for contingency plans to address responses to uncontrolled surface discharges that may travel overland to enter a stream running through or adjacent to the WHPA. It may also identify critical aquifer recharge areas requiring protection.

The regional technical committee further recommended specific land uses that are of risk and pose a threat to well head protection areas. Specific land use controls were recommended based upon the type of land use and the particular zone it is located

in. Further recommendations were made for establishment of new uses, and continuation or expansion of existing uses considered a risk.

3. The City of Lacey Wellhead Protection Program:

Since the late 80s the City of Lacey has worked towards ground water protection. In 1999 the City of Lacey has proposed the development of adopted a wellhead protection program for the domestic production wells operated by the City of Lacey. The program is based upon the recommendations of the regional technical committee, for the protection of wellhead protection areas. These recommendations, now codified as standards, provide specific land use requirements for activities taking place within the designated 1, 5 and 10 year TOT zones.

The plan current program, is expected to accomplish along with work developed over the last decade, has accomplished the following objectives:

- i) Determined hydrogeologic boundaries for differing travel times within the wellhead recharge zones using Environmental Protection Agency and U.S.G.S. models.
- ii) Identified all sources and potential sources of pollution within the hydrogeologic boundaries.
- iii) Conduct additional testing and monitoring as required for hydrogeology and water quality, and developed an on-going monitoring strategy.
- iv) Recommend measures, tools, land use controls, other regulatory controls and other contingencies for wellhead protection.
- v) Develop and implement a public involvement and education action plan.

The development of this work the plan is was being provided in part by a grant from the Department of Ecology.

D. Conclusions



Based on the above analysis, the City has formulated the following conclusions:

1. Thurston County's groundwater is a critical resource to Thurston County because it supplies virtually 100% of the area's water needs and there is no alternative water source.
2. Northern Thurston County groundwater is susceptible to contamination. Soils and geologic structures combine to create sensitive areas susceptible to groundwater contamination. Such areas need to be protected.
3. There is a need for the City of Lacey to have designate and enact legislation to protect aquifer recharge areas and wellhead protection areas for the protection of Lacey's water supplies.
4. The City should continue with pursue and complete their it's wellhead protection program. The recommendations developed by the regional technical committee and enacted by Lacey was based upon extensive research, utilized significant data from a number of studies, and represents best available science for aquifer protection in the Thurston County area.

E. Goals/Policies

1. Goal

To protect the quality and to manage the quantity of groundwater for all uses in the present and the future.

A. Policy

The City of Lacey shall seek to prevent groundwater contamination by protecting the entire resource as effectively as possible, but within the limits of what is acceptable and affordable to the community.

B. Policy

The City of Lacey shall strive to provide additional protective measures to protect beneficial uses, especially drinking water supplies.

C. Policy

~~To~~ The City of Lacey Shall strive to prevent contamination of drinking water supplies and to develop contingency plans to provide additional sources should an existing source become unusable.

D. Policy

The City of Lacey shall strive to assure that preventive actions are taken to protect water quality from further degradation and that the City, in cooperation with the Department of Ecology, will promote corrective actions in areas where degradation has occurred so that the net effect is a gradual improvement of the ground and surface water quality.

E. Policy

Legislation shall be ~~adopted~~ maintained, and updated as necessary, regulating land uses within aquifer sensitive areas and wellhead protection areas.

F. Policy

The City ~~should complete~~ shall utilize a wellhead protection program based upon best available science that includes:

- a) Determination of hydrogeologic boundaries;
- b) Land use inventory that identifies sources and potential sources of pollution;
- c) Additional monitoring;
- d) ~~Recommendations~~ Requirements for land use and other regulatory controls;
- e) Contingency planning for replacement and/or response to contaminated wells; and
- f) Implementation of a public involvement and education plan.