Winter 2010

Urban chicken farming environmental impact assessment, Bellingham, WA

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An Environmental Impact Assessment of Urban Chicken Farming

Bellingham, WA

Photos Courtesy of Annitra Ferderer

Environmental Impact Assessment
Huxley College of the Environment
**Environmental Impact Assessment**

Huxley College of the Environment

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Date  
3/15/10
An Assessment of Urban Chicken Farming in Bellingham, WA

Urban Chicken Farming
Environmental Impact Assessment,
Bellingham Washington

Prepared for ENVR 436/536, Winter 2010
Under the Supervision of Dr. Leo Bodensteiner
Huxley College of the Environment
WESTERN WASHINGTON UNIVERSITY

Prepared by:
Amanda Jobmann
Jessie Rosanbalm
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This report represents a class project that was carried out by students of Huxley College of the Environment, Western Washington University. It has not been undertaken at the request of any persons representing local government or private individuals. Nor does it necessarily represent the opinion or positions of individuals from government or the private sector.
March 10, 2010

Dear Concerned Citizen:

As a growing number of households are choosing to raise backyard chickens, the City of Bellingham is proposing a more stringent ordinance regulating chicken ownership within the city limits. This Environmental Impact Assessment (EIA) was performed as a class project under the supervision of Dr. Leo Bodensteiner to analyze the proposed ordinance. The city’s proposed ordinance stipulates that owners would need to house their chickens in secure enclosures no closer than fifty feet from neighboring properties. This EIA also analyzes the impacts of the livestock ordinance currently regulating chicken ownership, which the proposed ordinance would replace. In addition we developed an alternative ordinance we think will best mitigate the major environmental impacts caused by chickens by limiting the number of chickens allowed per acre and requiring owners to implement best management practices (BMP).

The alternative ordinance is the preferred course of action recommended by our team. It offers the most reasonable compromise to limit environmental degradation while still allowing citizens to raise their own chickens.

We hope that our analysis helps you better understand the potential impacts associated with backyard chickens and how this alternative ordinance can help to mitigate these impacts.

Sincerely,

The Bellingham Urban Chicken EIA Team
An Assessment of Urban Chicken Farming in Bellingham, WA

FACT SHEET

PROJECT TITLE: Urban Chicken Farming

PROJECT SITE DESCRIPTION:
Bellingham is located in the northwest part of Washington State in Whatcom County. Bordered to the west by Bellingham Bay, the city is located about 90 miles north of Seattle, 21 miles south of the Canadian border and about 52 miles south of Vancouver, B.C (Figure1). The City encompasses about 28 square miles. Bellingham is divided into 23 neighborhoods and the current population is 76,130. The 20 year population growth forecast estimates the population will grow to 113,055 (COB).

PURPOSE OF THE ACTION:
The purpose of this EIA is to guide the implementation of future COB ordinances regulating ownership of chickens in Bellingham in order to:
- Protect water quality to ensure human health
- Preserve environmental quality for native species and aesthetics
- Resolve the debate between backyard farming and environmental conservation

PROJECT DESCRIPTION:
This document analyzes the environmental impacts of backyard chicken-farming in the city of Bellingham (COB). The impacts associated with the existing ordinance are examined (No Action alternative) and compared to impacts of an ordinance proposed by the COB and an alternative ordinance developed by this EIA team. After considering the impacts of the three options, the preferred course of action is the alternative ordinance. This ordinance is the best option to minimize environmental impacts associated with backyard chicken farming, while still allowing individuals to raise chickens within the city limits of Bellingham.

PROPOSER: Huxley Environmental Impact Assessment Winter 2009-ESCI 436/536

PROJECT PROONENTS/ LEAD AGENCY:
Huxley College of the Environment
Western Washington University
Bellingham, WA 98225

CONTACT PERSON:
Dr. Leo Bodensteiner
Huxley College of the Environment, Western Washington University
Bellingham, WA 98225
PERMITS:
Potentially included but not limited to:

- **Biosolids Management Permit**
  - **PURPOSE:** This permit authorizes the beneficial use of biosolids, the transfer of biosolids within a facility or from one facility to another, the storage of biosolids, and the disposal of biosolids in municipal solid waste landfills. This general permit establishes the conditions that must be met for the above activities in the State of Washington, according to the provisions of Chapter 173-308 WAC, Biosolids Management. – WSDE website

- **Dangerous Waste Treatment Storage Disposal Facility**
  - **PURPOSE:** To specify in detail how dangerous waste must be managed at a particular facility. Renewal permits are only applicable to facilities that currently have a dangerous waste permit. Its purpose is to protect human health and the environment and ensure the facility knows what is required to be in compliance with the dangerous waste regulations. – WSDE website

- **National Pollutant Discharge Elimination System (NPDES) Individual Permit**
  - **PURPOSE:** To prevent the pollution of the State’s surface waters. – WSDE

- **Resource Conservation and Recovery Act (RCRA) Site Identification Number**
  - **PURPOSE:** The required Resource Conservation and Recovery Act (RCRA) Site ID# is an identifying number used for tracking wastes from their point of generation to final disposal. The Uniform Hazardous Waste Manifest system (EPA Form 8700-22) is the primary mechanism to ensure that wastes reach their intended destination. The transporter and the receiving facility’s signatures on the manifest you have prepared and sent with the shipment provide some assurance that the waste has been properly handled. – WSDE website

- **State Wastewater Discharge Permit**
  - **PURPOSE:** To prevent pollution of groundwater and prevent the upset of municipal wastewater treatment systems by limiting the discharge of pollutants. Discharge of wastewater pollutants to land requires a State Wastewater Discharge Permit. – WSDE website

*All the above permits issued through the Department of Ecology*
EIA Contributors:
Madeleine Eckmann - Environmental Health, Land & Shoreline, Current/Past Ordinances
Annitra Ferderer - Editor, Record Keeper, Air Quality, Energy & Natural Resources
Amanda Jobmann - Facilitator, Plants and Animals, Permits
Jessie Rosanbalm - Editor, Water Quality, Key Players
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Huxley Map Library
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EIA Team Contributors

ISSUED:
March 10, 2010

PUBLIC PRESENTATION:
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Chuck Timblin – Whatcom Conservation District, Small Farm
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An Assessment of Urban Chicken Farming in Bellingham, WA

TABLE OF CONTENTS:

Fact Sheet..............................................................................................................................................v
Permits..................................................................................................................................................vi
Glossary..................................................................................................................................................xi
Acronyms...............................................................................................................................................xiv

CHAPTER 1- SUMMARY.................................................................................................................1
  1.1 PROPOSED ACTION
  1.2 ALTERNATIVES
    1.2.1 Alternative 1
    1.2.2 Alternative 2
    1.2.3 No action
  1.3 Scope of EIA
    1.3.1 Elements of the environment considered
    1.3.2 Elements of the environment not considered
  1.4 Recommendation
  1.5 Decision Matrix.........................................................................................................................5

CHAPTER 2-BACKGROUND AND HISTORY..................................................................................7
  2.1 BACKGROUND
    2.1.1 Delineation of city limits
    2.1.2 Description of watershed

CHAPTER 3-ELEMENTS OF THE NATURAL ENVIRONMENT......................................................9
  3.1 EARTH..........................................................................................................................................9
    3.1.1. Geology
            Existing Environment
            Impacts
    3.1.2 Soils
            Existing Environment
            Impacts
    3.1.3 Topography
            Existing Environment
            Impacts
    3.1.4 Watershed
            Existing Environment
            Impacts
    3.1.5 Unique Physical Features
            Existing Environment
            Impacts
    3.1.6 Erosion/enlargement of land area
  3.2 AIR.............................................................................................................................................13
    3.2.1 Air Quality
            Existing Environment
Impacts

3.2.2 Odor
Existing Environment Impacts

3.3 WATER

3.3.1 Surface water
Existing Environment Impacts

3.3.2 Runoff/Absorption
Existing Environment Impacts

3.3.3 Floods
Existing Environment Impacts

3.3.4 Groundwater
Existing Environment Impacts

3.3.5 Public Water Supplies
Existing Environment Impacts

3.4 PLANTS AND ANIMALS

3.4.1 Habitat
Existing Environment Impacts

3.4.2 Biodiversity of Species
Existing Environment Impacts

3.4.3 Unique Species
Existing Environment Impacts

3.4.4 Fish migration routes
Existing Environment Impacts

CHAPTER 4 - ELEMENTS OF THE BUILT ENVIRONMENT

4.1 ENVIRONMENTAL HEALTH

4.1.1 Noise
Existing Environment Impacts

4.1.2 Risk of Explosion
Existing Environment Impacts

4.1.3 Releases to the environment affecting public health
Existing Environment Impacts

4.1.4 Watershed
CHAPTER 5 – APPENDICIES ........................................................................ 44

5.1 Key Players ..................................................................................... 45

5.2 Ordinances and Regulations ............................................................. 45

5.2.1 Existing Ordinance .................................................................... 45

5.2.2 Proposed Ordinance .................................................................. 45

5.2.3 Alternative #1 Ordinance ......................................................... 45

5.2.4 Alternative #2 Ordinance ......................................................... 45

5.2.5 Conservation Program On Agricultural Lands ......................... 45

5.2.6 Whatcom County Critical Areas Ordinance .............................. 45

5.2.7 Chapter 90.48 RCW: Water pollution control ........................... 45

5.2.8 Chapter 90.54 RCW: Water resources Act ............................... 45

5.2.9 Chapter 173-201A WAC: Water Quality Standards ................ 45

5.2.10 Chapter 173-216 WAC: Discharge Permits .............................. 45

List of Figures ........................................................................................ 46

Figure 1. Topography of the City of Bellingham .................................. 46

Figure 2. Economic value of Whatcom County agriculture ................. 46

Figure 3. Soil types in Bellingham ....................................................... 46

Figure 4. Watersheds within the City of Bellingham ......................... 46

Figure 5. Chinook stream use and spawning areas in Bellingham, WA 46

Figure 6. Chum stream use and spawning areas in Bellingham, WA 46

Figure 7. Coho stream use and spawning areas in Bellingham, WA 46

Figure 8. Steelhead stream use and spawning areas in Bellingham, WA 46

Figure 9. Trout stream use and spawning areas in Bellingham, WA 46

Figure 10. Vegetation cover within the city limits of Bellingham .......... 46

Figure 11. Neighborhoods within the City of Bellingham ................... 46

5.3 List of Tables and Scanned Documents .......................................... 60
REFERENCES.........................................................................................................................................................67

GLOSSARY

**aerobic**: living or occurring only in the presence of free uncombined molecular oxygen, either as a gas in the atmosphere or dissolved in water.

**agricultural activity**: a condition or activity, which occurs on agricultural land in connection with the commercial production of agricultural products.

**agricultural land**: commonly refers to all property used in the commercial production of agricultural products including land, buildings, freshwater ponds and machinery.

**ammonification**: the breakdown of proteins and amino acids, especially by fungi and bacteria, with ammonia as the excretory byproduct.

**anaerobic**: an organism or process adapted to environmental conditions devoid of oxygen.

**aquifer**: an underground layer of the earth, gravel or porous stone that yields water.

**Best Management Practices** (BMP): physical, and/or managerial practices that are recognized by an industry to prevent or reduce environmental damage.

**buffer**: an area that consists of natural and planted vegetation, often adjacent to a stream or other boundary, either natural or man-made.

**confinement areas**: outdoor areas in which livestock are confined by fencing or structures throughout the year.

**coop**: confinement structure chickens are kept in.

**critical areas**: geologically hazardous areas, frequently flooded areas, critical aquifer recharge areas, wetlands, and fish and wildlife habitat conservation areas.*

**dentrification**: the reduction of nitrates and nitrites to nitrogen by microorganisms.

**detritivores**: organisms that feed on dead organic matter, usually detritus feeding organisms other than bacteria and fungi.

**drainage ditch**: a man-made watercourse designed to carry surface water or groundwater.
erosion: the washing away of soil by water, wind, or other natural agents.

eukaryotes: organisms whose cells have membranous organelles, notably the nucleus.

eutrophication: the addition of nutrients such as nitrates and phosphate to a body of water usually resulting in increased biotic production and adverse effects for human use.

fecal coliform: an indicator of recent fecal pollution. If present, fecal coliform may indicate the presence of pathogens.

histosol: soils composed mainly of organic matter (at least 20-30% by weight) and more than 40 inches thick.

impervious surfaces: buildings or surfaces on the land that create a physical barrier to the penetration of water into the ground. Rain that falls on impermeable surfaces immediately flows overland in the direction of the slope, carrying along with it pollutants in its path.

liquid manure: a suspension of animal wastes in a free flowing fluid, usually with a solid content of less than ten percent.

Maximum Contaminant Level (MCL): the maximum allowable level for a specified contaminant. Contaminant levels above the MCL indicate a concentration at which adverse health effects may occur.

nitrification: the breakdown of nitrogen-containing organic compounds into nitrates and nitrites.

nitrogen fixation: the conversion of atmospheric nitrogen to forms usable by organisms.

pathogens: disease-causing organisms.

riparian zone (or area): an area adjacent to a seasonal or year-round stream containing diverse vegetation such as trees, shrubs, plants and grasses which provide transitional, or foraging, habitat for many forms of wildlife.

roof runoff structures: structures developed to collect, control and transport precipitation runoff from roofs away from animal confinement areas.

Species of Concern: Include those species listed as State Endangered, State Threatened, State Sensitive, or State Candidate, as well as species listed or proposed for listing by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. WAC 232-12-011.
State Candidate Species (SC): Include fish and wildlife species that the Department will review for possible listing as State Endangered, Threatened, or Sensitive. A species will be considered for designation as a State Candidate if sufficient evidence suggests that its status may meet the listing criteria defined for State Endangered, Threatened, or Sensitive. WAC 232-12-011

State Endangered Species (SE): Any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state."WAC 232-12-297, Section 2.4

State Sensitive Species (SS): Any wildlife species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened throughout a significant portion of its range within the state without cooperative management or removal of threats. WAC 232-12-297, Section 2.6

State Threatened Species (ST): Any wildlife species native to the state of Washington that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats. WAC 232-12-297, Section 2.5

Total Maximum Daily Limit (TMDL): the total amount of fecal coliform bacteria allowed by the DOE for a given classification of waterway. For example, a Class A waterway should have less than 50 fecal coliform/100ml.

total nitrogen: all chemical forms of nitrogen, especially nitrate, nitrite, and ammonium.

watershed: topographic depression on the land that collects all water and drains to a central point.

*As defined by the Whatcom County Code 16.16
ACRONOMS

AFO – Animal Feeding Operations
AU- Animal Unit
BMPs – Best Management Practices
COB – City of Bellingham
CPAL – Conservation Program on Agricultural Lands
DNS – Determination of Non-significance
DOE – Department of Ecology
DOH – Department of Health
GMA – Growth Management Act
EIA- Environmental Impact Assessment
EIS – Environmental Impact Statement
LS – Locally Significant
PHS – Washington Department of Wildlife Priority Habitats and Species Program
TMDL – Total Maximum Daily Limit
USDA – United States Department of Agriculture
WAC – Washington Administrative Code
WCHD – Whatcom County Health Department
WSDA – Washington State Department of Agriculture
WSDE – Washington State Department of Ecology
CAFO – Concentrated Animal Feeding Operations
H2S– Hydrogen Sulfide
1. Executive Summary

1.1 PURPOSE

The purpose of this Environmental Impact Assessment (EIA) is to determine the effects of backyard chicken-farming in the City of Bellingham (COB). The impacts associated with raising farm animals within the city limits of Bellingham are thoroughly investigated with regard to water quality, soil pollution, air quality, environmental health, plants, animals and land use. This EIA investigates the positives and negatives of allowing chickens within an urban environment, two alternatives which include a remediated ordinance with greater restrictions for better environmental security and a no tolerance for chickens, along with a No Action Alternative of allowing the current ordinance to remain.

1.2 PROBLEM DESCRIPTION

Currently, the city of Bellingham has in force an ordinance with little control over the environmental impacts associated with raising chickens in an urban environment with high human population density. Using the process outline by the State Environmental Protection Act (SEPA) we determined the most damaging impacts of chickens on elements of the environment (as defined in SEPA) result from their manure (Table 3). To mitigate these impacts best management practices (BMPs) encouraging proper disposal of waste are implemented in the ordinance outlined in Alternative Action Number Two.

1.3 DESCRIPTION OF PROPOSED ACTIONS AND ALTERNATIVES

Proposed Action

The Proposed Ordinance will restrict chickens from wandering freely through Bellingham by mandating a confinement structure. This ordinance being proposed by the COB, titled “Keeping Animals in the City Limits of Bellingham,” (Appendix 5.1.2) will prevent chickens from spreading their waste to undesirable places and causing environmental detriment. Also, chickens would be banned from areas in the city limits which are part of the Lake Whatcom watershed (Figure 4) as listed in the Bellingham municipal code under the title “The keeping of fowls and animals” (Appendix 5.1.2).

Alternative Action #1

Alternative Ordinance Number One would entail chicken ownership through a new re-structured ordinance, limiting the number of chickens to twenty per acre, requiring that all chickens remain confined, and banning chickens in city limits that are part of the Lake Whatcom Watershed (Appendix 5.1.3). This
ordinance emphasizes proper waste management and acknowledges the Critical Areas Ordinance. Full disclosure of chicken ownership would be ensured by mandated permits, which would be obtained through the Whatcom Humane Society.

We developed this ordinance based on the Best Management Practices (BMPs) suggested for small farms by the Whatcom Conservation District (WCD). They developed guidelines for small farmers to best mitigate manure impacts generated by chickens. We feel that the restrictions in this ordinance are an appropriate compromise between community values and environmental stewardship. Twenty chickens per acre (or five chickens per quarter acre, which is the average size of a city lot) will allow families to own enough chickens to meet their egg demand, while limiting the amount of manure produced to an amount that can be managed with BMPs.

**Alternative Action #2**

Alternative Ordinance Number Two would sever all privileges allowing chickens within the city limits of Bellingham (Appendix 5.1.4). This no tolerance ordinance would go into effect immediately, with a one-month time allowance to remove all livestock, structures, and waste from property, responsibly and effectively.

**No Action Alternative**
The No Action Alternative would continue to allow unrestricted chicken ownership within the city limits (Appendix 5.1.1) (Figure 1). This regulation requires these animals to be kept in sanitary conditions. However the terms of sanitary are broadly used for all animals and do not define specific conditions. Under this regulation, the local health official is responsible for enforcing this code and violators may be charged up to one hundred dollars or thirty day imprisonment.
Figure 1. Aerial photo of the City limits of Bellingham taken in 2009.
1.4 RECOMMENDATION

After considering the impacts of the three options, the preferred course of action is the Alternative Action Number One. We developed this alternative as a compromise between environmental degradation and important community values. After completing this EIA, we feel that the stipulations of this ordinance mitigate environmental impacts enough that the implementation of Alternative Ordinance Number Two, completely banning chickens, is unnecessary.

This EIA indicated that the most harmful impacts of chickens resulted from their waste products. Chicken manure contains elements which make it a very serious pollutant and any discharge will most likely violate local, state, or federal regulations, which are enforced by fines or other penalties (Critical Areas Ordinance, Appendix 5.1.6). In order to mitigate these impacts, Alternative Ordinance Number One highlights BMPs for hobby chicken farmers and would reduce the number of chickens allowed per acre. These BMPs ensure proper disposal and treatment of chicken manure.

In addition to this alternative we propose a greater abundance of resources for educating these small-scale hobby farmers. This would help further mitigate the environmental impacts of these backyard farming practices that are a growing concern as the trend to own backyard chickens continues to increase in Bellingham.
### 1.5 Decision Matrix

<table>
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<tr>
<th>Elements of the Natural Environment</th>
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**Legend**

- ▲ = Significant Positive Impact
- △ = Minor Positive Impact
- O = No Impact
- ▽ = Minor Adverse Impact
- ▼ = Significant Adverse Impact
### Elements of the Built Environment

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- ▲ = Significant Positive Impact
- △ = Minor Positive Impact
- O = No Impact
- ▼ = Minor Adverse Impact
- ▼ = Significant Adverse Impact
2. History of Farming in Whatcom County

Washington State has historically remained an agricultural based state economically. Whatcom County is number one in the nation in milk production per cow - producing more than 1.3 billion pounds of milk each year. Whatcom County is also the nation's raspberry capital harvesting more than 57 million pounds each year. Farming has been a strong economic driver in Whatcom County with many farms over a century old, with 1,485 farms farming a total of 148,027 acres.

A growing number of Bellingham residents within the city limits either possess or would like to possess a small-scale farm. A small farm is a non-commercial operation, sometimes called a hobby farm, usually between 5 and 40 acres. Small farm owners typically maintain a career off the farm but enjoy the lifestyle that living on a small acreage farm provides. Small acreage farms in Whatcom County often include beef cattle, pigs, horses, mink, poultry, llamas, goat, and, sheep.

The residents living within the Bellingham city limits that have chickens are found most commonly to have a small number. The results of a survey distributed as part of this EIA found that the most common response to questions about the reasons for having a small number of chickens within the city limits is “to have my own eggs and know where my food comes from.” According to recent statistics there are a growing number of city-dwellers across the country raising chickens in their back yard, raising them for eggs that proponents say taste fresher, for pest control, for fertilizer, and for a low-cost source of protein. The desire for access to eggs produced without antibiotics and a greater emphasis on locally produced food are viewed as benefits of backyard chickens. With Bellingham’s culture focused primarily on local foods and sustainability, it is not uncommon to find residents using their front yard to grow vegetables and the natural extension of chickens occupying the backyard.

One would assume that the positives would be abundant through this self-sustaining practice; however through the investigations of this EIA we found that this practice results in moderate amounts of fecal waste production that still require proper waste management. Allowing this waste to remain near waterways or unconfined aquifers results in contamination of surface and groundwater with nutrients and pathogenic bacteria. Principal contamination processes include leaching to groundwater and surface transport by storm water to surface waters.

The Washington State Department of Agriculture (WSDA) requires anyone who possesses a small-scale poultry production facility to acquire a permit and license. Poultry processing in the United States is regulated by the Federal Poultry Products Inspection Act. This includes chicken, geese, duck, turkey and other domesticated birds raised for meat. In Washington State, there are currently two ways that small-scale poultry producers may be exempted from this Act. One is the WSDA Special Poultry Permit and the other is by getting a WSDA Food Processors License. However, possessing less than 30 birds in Whatcom County for personal use, not to market, requires no permits. Possessing poultry within the city limits of Bellingham is congruent with this lack of ordinance.
From 1995-2000 the increase of population percentage in Whatcom County was 12 percent as compared to an historical average of 4 percent. With the growing focus on sustainability, having a relationship with one’s food, and the economical benefits, urban chickens are becoming more popular so we must look at the impacts that would result from a large number of urban backyard chickens. This increase could result in a number of environmental impacts including water and soil contamination, air quality issues with regards to odor, and environmental health concerns. We believe that small-scale urban farmers and regulators need to take measures to protect against these impacts.

![Diagram of agricultural income in Whatcom County in 2007.](image)

Figure 2. Monetary distribution of agriculture in Whatcom County in 2007.
3. Elements of the Natural Environment

3.1 EARTH

3.1.1 Geology
The geology of Bellingham does not have a significant impact to the environment if chicken waste were to build up in the city. Bellingham’s geologic structure is a result of the last ice age 10,000-20,000 years ago. The bedrock under most of Bellingham is made up of Chuckanut Sandstone (USGS). There is very little risk of this cracking and faulting like we might expect from a more sensitive bedrock like limestone. On top of this bedrock are layers of glacier till of varying thicknesses deposited by the receding glaciers at the end of the ice age 10,000 years ago. The glacial deposits make up the majority of the soil in the city which will be explained in the next section.

3.1.2 Soils
Existing Environment
There are numerous soil types within the city of Bellingham (Figure 3). Many of these soils cover very little land within the city and will not be of significant importance in assessing impact. Soils behave differently when exposed to varying environmental conditions. It is important to consider soil type when considering chicken impacts on a wider scale.

The greatest impact from chickens on the soil will come from the waste produced by them. This will need to be taken into consideration on soils that are either highly permeable or very compact. On permeable soils chicken waste will infiltrate into the soil and possibly into the water table. On compact soils the chicken waste will flow over land into surface water sources during rain events. This could be a serious problem in Bellingham during fall and winter months when precipitation events can be large and frequent.

The most permeable soil in Bellingham is the Everett Complex which covers a significant land area in the southern end of Bellingham. This is also a very deep soil meaning that on a particularly rainy day any chicken waste on the surface has a higher chance of reaching the water table. Other permeable soils are the Andic Xerochrepts, Chuckanut loam (abundant around WWU), and the Squalicum gravelly loam which covers about a quarter of the city. Chicken waste can penetrate deep into these soils. On the other side are soils that are more compact and therefore more prone to surface pooling and runoff. These are much less abundant, making up only 10% or less of the soil cover in the city. There are more types of relatively compacted soils in Bellingham but they cover a much smaller percentage of land. These soil types include Bellingham silty loam, Biscott silty loam, Fishtrap muck, and an assortment of histosols.

Proposed Action:
Chickens will have the greatest effect in areas of Bellingham where there are very permeable soils, such as the eastern side of the city where Squalicum gravelly loam is very prevalent. It is important that most of the Bellingham city land within the
Lake Whatcom watershed is covered by Squalicum gravelly loam, especially in the Lake Whatcom watershed due to the vulnerability of the soil.

Chickens will be confined within the owner’s property. This will allow officials to track how many chickens live on each coil type.

**Alternative 1:**
Chickens will be confined to the chicken owner’s land. This will give enforcement agencies the knowledge of the kind of soil on which chicken soil is deposited. This will be useful should city government ever want to confine chicken farming in the city by soil type.

**Alternative 2:**
With no chickens allowed anywhere in Bellingham there will be no chicken waste entering any kind of soil in the city.

**No Action Alternative**
Chickens will be allowed free range to roam. This allows chickens to move unrestricted over all soil types.

**3.1.3 Topography**
Bellingham has few significant topographic features of relevance within city limits. City wide topography will not be impacted due to the fact that a chicken’s footprint on the land is confined to a small area at an individual residence. Even a significant slope at a very small scale in a person’s backyard will not affect our proposal to limit chicken farming in the city because there are very few sites exhibiting this.

**3.1.4 Unique physical features**

**Existing Environment**
The Lake Whatcom watershed is of significance in the development of a chicken management plan. The lake is the source of drinking water for citizens of Bellingham and Whatcom County. A small portion of the western edge of the watershed lies within the city (Appendix B). Therefore strict regulations are enforced for land use. Chicken manure contains a high level of phosphorus. This must be addressed by any current or future regulations on chicken farming within Bellingham.

**Impacts**

**Proposed Action:**
The ordinance proposed by the COB allows for residential chicken farming to occur anywhere in the city. However, there is a separate municipal code (Appendix A - 16.80.060) restricting all future animal husbandry, including chickens, in the Lake Whatcom watershed. The restricted area encompasses most of the Silver Beach neighborhood. The municipal code reduces the amount of contaminants potentially entering the Lake Whatcom watershed. In so doing contaminants are also kept out of Lake Whatcom, keeping the city’s drinking water clean.
Alternative 1:
The Lake Whatcom watershed remains an important area of enforcement in order to keep Bellingham drinking water clean.

Alternative 2:
Chicken waste will not be of concern in this proposal because there will be no chickens allowed in the city or Lake Whatcom Watershed.

No Action Alternative
Chickens are allowed in the Lake Whatcom watershed. This will increase the amount phosphorus and other harmful materials to enter lake Whatcom contributing a negative impact the the area and the city’s drinking water.

3.1.5 Erosion/enlargement of land area
We foresee no instance when raising chickens within the City of Bellingham would cause significant erosion or enlargement of land. Any erosion or enlargement that occurs as a result of chickens will likely be on a scale too small to be efficiently detected.
Figure 3. Map of soil types in the city of Bellingham.
3.2 AIR

3.2.1 Air Quality

**Existing Environment**

*Airborne Fecal Coliform*

Bacteria are single-celled, prokaryotic organisms (without a true nucleus) which reproduce asexually by a simple division of cells called binary fission. They are the most numerous organisms on earth, living in nearly all environments including scalding hot springs, oceanic thermal vents, oxygen depleted benthic sediments, polar ice caps, the insides and surfaces of other organisms, in water, soil and air. A number of bacteria occur naturally in freshwater streams. Some are found free-living in the water and sediments as photosynthetic autotrophs or as saprophytes living on dead matter. Others exist in or on other organisms as: mutual symbiontes - providing some benefit to the host organism in exchange for a place to live; commensals - neither helping nor harming the host; or parasites and pathogens - utilizing the host in a way that causes harm. Certain bacteria that live in the intestinal tracts of animals are essential for the recovery of nutrients from digested food. Millions of these naturally occurring organisms are passed out of the body of animals with fecal wastes. If pathogenic (disease-causing) organisms are present, they may be passed as well. Airborne Fecal Coliform are pathogenic microorganisms that are carried in automized liquid manure droplets. Studies have shown that these bacteria are within the size range that penetrate human lungs. This creates an area of concern when allowing urban livestock, such as poultry, in high density human populated areas. The air quality is negatively affected by the concentration of these bacteria.

Microbial air pollution from concentrated animal feeding operations (CAFOs) has raised concerns about potential public health and environmental impacts. A recent investigation was conducted in 2008 measuring the levels of bioaerosols released from various operating poultry farms in the United States. Air samples taken at the participating CAFOs were analyzed for several indications for present pathogenic microorganisms, including culturable bacteria and fungi, fecal coliform, *Escherichia coli*, *Clostridium perfringens*, bacteriophage’s, and *Salmonella*. At all of the investigated farms, bacterial concentrations at the downwind boundary were higher than those at the upwind boundary, suggesting that the farms are sources of microbial air contamination. An average hen produces one-cubic foot of manure every six months. The potential for transmittal of airborne fecal coliform exist’s with these estimated amounts of fecal waste.

In addition, samples were found to be positive for fecal coliform, *E. coli*, *Clostridium*, and total coliphage. Based on statistical comparison of airborne fecal indicator concentrations at alternative waste treatment technology farms compared to control farms with conventional technology, the alternative waste treatment technologies appear to perform better at reducing the airborne release of fecal indicator microorganisms during on-farm treatment and management processes. These results demonstrate that airborne microbial contaminants are released from poultry farms when not properly decomposed and pose possible exposure risks to farm workers and nearby neighbors.
The release of airborne microorganisms appears to decrease significantly through the use of certain alternative waste management and treatment technologies. Proper waste management techniques of off-site disposal and/or efficient composting practices keep these airborne bacteria, especially fecal coliforms, from being present within the chicken housing area of the yard. Compost, when done correctly, kills the pathogens that would otherwise be exposed resulting in the possibility of airborne transport. Composting is a controlled, microbial process that converts biodegradable, organic materials into a stable, humus-like product called compost. The activity of these microorganisms is influenced by the carbon to nitrogen (C:N) ratio, oxygen supply, moisture content, temperature, and pH of the compost pile. Properly managed composting increases the rate of natural decomposition and generates sufficient heat to destroy pathogens, reducing airborne bacteria.

**Manure Gases**

Manure gas is not a serious problem with fresh manure. However, the breakdown of fecal waste through decomposition does possess some toxic side effects in the form of manure gases. The decomposition process of the poultry manure can take place in two ways. If oxygen supply is sufficient, then the decomposition is said to be aerobic. The aerobic decomposition of poultry manure is basically an odorless process which produces stabilized organic matter, some carbon dioxide and water by microorganisms. During anaerobic decomposition (lack of oxygen) of poultry manure, an abundant amount of carbon dioxide, ammonia, hydrogen sulfide and methane gases are produced which are hazardous to both man and livestock. The most dangerous of these gases are:

**hydrogen sulphide (H2S)**

Hydrogen sulfide is the most toxic and is potentially the most dangerous. Hydrogen sulfide is produced during the anaerobic decomposition of manure. High concentrations of H2S are greatly hazardous and lethal to animal life.

**carbon dioxide (CO2)**

Carbon dioxide is highly soluble in water and is released from manure decomposition and animal respiration. Carbon dioxide is not a serious problem in a well ventilated facility. Problems can occur if failure of the ventilation system occurs. Death due to carbon dioxide asphyxiation could occur for the chickens inside a given structure, though very rarely.

**ammonia (NH3)**

Ammonia is highly soluble in water. It can easily explode at higher concentrations and acts as an irritant to most tissues at low concentrations. Severe eye irritation, respiratory spasm, rapid asphyxia, and/or death occurred at higher ammonia concentration.

**methane(CH4)**

Methane is a highly flammable gas that is produced from the anaerobic decomposition of manure. At low concentrations, it burns with a blue flame but at higher concentrations there is a danger of explosions. The majority of methane gas is the result of the decomposition of animal manure. Since methane is lighter than
air, it has a tendency to rise and pool at the top of stagnant corners or in tightly enclosed manure storage pits.

In addition, the potential toxic effects of manure gases give rise to human health concerns. Manure gas is not a serious problem with fresh manure, but when manure is stored for several weeks or months it is attacked by anaerobic bacteria that produce many different gases. If manure is stored in a covered tank or similar enclosed space, gases can accumulate in the tank's headspace, as well as in the form of bubbles and dissolved vapors trapped within the manure itself.

**Impacts**

**Proposed Action:**
With the proposed ordinance governing the practice of possessing urban chickens within the COB, the potential of airborne fecal coliform and manure gases remains a possible threat to air quality. Due to the lack of regulations concerning these air quality issues in regards to proper fecal waste removal and/or proper composting and the unlimited potential to possess any number of chickens within the COB, the impacts remain high without monitor and/or control.

**Alternative 1:**
There is the possibility that chicken owners would not comply with this alternative ordinance and regulating these urban hobby farmers would be costly and require staffing and monitoring. The effects of a person lacking in proper disposal and/or proper composting would result in the shared air quality surrounding an area with chicken fecal waste to become unhealthy for all persons and animals.

**Alternative 2:**
There would be no significant adverse impact by having no chickens allowed within the COB with regard to air quality.

**No Action Alternative:**
The adverse impacts would be the same for the proposed ordinance.

**3.2.2 Odor**

**Affected Environment**
Hydrogen sulfide and ammonia are among the main sources of animal manure odors. Ammonia has a strong, pungent odor. It is released from fresh manure and during the process of anaerobic decomposition. Hydrogen sulfide is the most toxic and is potentially the most dangerous of the manure gases and it can be identified by its characteristic smell similar to rotten eggs (see Appendix, Table 1). Hydrogen sulfide is produced during the anaerobic decomposition of manure.

Besides the gases listed in section **3.2.1 Manure Gases**, several types of amides, peptides, organic and volatile fatty acids, and free fatty acids are decomposed and create an obnoxious environment (interaction of putrefactive, rancid, and fermentative odor) during anaerobic decomposition of poultry manures. These are intermediates of protein, lipid and carbohydrate metabolism and accumulate in anaerobic decomposition systems. The odors are the result of the biological
breakdown of the poultry manure under anaerobic conditions within storages, piles, lagoons, and indoor pits.

The decomposition process of the poultry manure can take place in two ways. If oxygen supply is sufficient, then the decomposition is said to be aerobic, if oxygen supply is insufficient, then its considered anaerobic. The aerobic decomposition of poultry manure is an odorless process which produces stabilized organic matter, some carbon dioxide and water by microorganisms. Under these preferred conditions the potential of manure gases from chicken waste would be minor. If lack of proper decomposition or removal of the fecal waste to an off-site facility is not practiced, the potential for manure gases to affect air quality by noticeable offensive odors will result.

**Impacts**

**Proposed Action:**
Due to the lack of sufficient waste disposal regulations, manure could result in unfavorable odors to chickens, owners and neighbors surrounding. As long as chickens are contained within a confined area, manure will continue to build up and be exposed to the air, especially with no limit to the number of chicken units allowable per household. With the population growth rate of Bellingham and the increasing trend of urban livestock (chickens), unhealthy air quality could result with a high potential for odor to become a problem. The proposed ordinance lacks regulations on a limit to the number of chickens allowable and has no regulations regarding proper waste management. This could create a negative impact, i.e. increase in odor due to the containment of chickens within the COB.

**Alternative 1:**
Poultry waste must be decomposed properly for better environmental odor management. The Proposed Alternative Ordinance would require that “odors from chickens, chicken manure, or other chicken-related substances shall not be perceptible at the property boundaries.” This clause in the ordinance provides fair recourse for neighbors who feel that chicken waste is not being properly disposed or composted and is creating odor problems. If chicken scraps, manure, and bedding are properly composted, the odors from the compost bin should not be noticeable to neighbors.

**Alternative 2:**
There would be no significant adverse impacts with regards to odor by not allowing chickens within the COB.

**No Action Alternative:**
The adverse impacts would remain the same as for the Proposed Action.
3.3 WATER

Nutrients in Poultry Waste

<table>
<thead>
<tr>
<th>Number of Chickens</th>
<th>Waste (g/day)</th>
<th>Total Solids (g/day)</th>
<th>Total N (g/day)</th>
<th>Ammonia (g/L N)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>182</td>
<td>54.6</td>
<td>2.1021</td>
<td>5.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Chickens</th>
<th>P2O2 (g/day)</th>
<th>K2O (g/day)</th>
<th>Fe2O3 (g/day)</th>
<th>SO3 (g/day)</th>
<th>CaO (g/day)</th>
<th>MgO (g/day)</th>
<th>ZnO (g/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.1</td>
<td>1.1</td>
<td>0.6</td>
<td>0.4</td>
<td>4.4</td>
<td>0.4</td>
<td>0.4</td>
</tr>
</tbody>
</table>

* measured in slurry

3.3.1 Surface water Existing Environment

Surface water is protected under WAC 173-201A. For surface water Washington State has established water quality standards have been created to protect certain uses. Measures of water quality of interest are fecal coliform, dissolved oxygen, temperature, pH, and turbidity. Generally, surface water from the city of Bellingham will run into Padden Creek, Squalicum Creek, Whatcom Creek, Chuckanut Creek, Bellingham Bay, and Chuckanut Bay (Figure 4).

Impacts

Proposed Action:
The proposed ordinance does not mandate waste management. Without waste management significant amounts of nitrogen, phosphorus, and other nutrients will enter surface waters via runoff, storm water, and groundwater. Poultry waste contains very high amounts of nutrients relative to other livestock wastes. The inorganic nutrients in manure are similar to those found in fertilizers. They are water soluble and are taken up my plants. Organic forms of nutrients are not water soluble and therefore are released more slowly as manure decays. Poultry manure is largely composed of inorganic nutrients. When it rains, large amounts of nutrients will be washed out of the manure and run into surface waters. Excess nutrients loads not only violate the Washington State surface water quality standards, but they cause algal blooms, which deplete the oxygen supply in streams, lakes, and marine waters, endangering wildlife. Lake Whatcom already has high amounts of phosphorus, resulting in low dissolved oxygen (Matthews, R. et al. 2009).
Alternative 1:
Under the proposed new ordinance waste management practices would be used to control the amounts of waste nutrients and solids entering surface water. Enforcement of the critical areas ordinance would prevent waste from being deposited directly in riparian zones, where it would enter surface water even more quickly.

Alternative 2:
No significant impacts.

No Action Alternative:
Under the No Action Alternative chickens are allowed in the Silver Beach area. The surface water in this area runs directly into Lake Whatcom, which already has too much phosphorus. Lake Whatcom is listed as polluted with phosphorus on Washington State’s 303d list. Adding extra nutrients would just make this worse, causing even more algal blooms and lower dissolved oxygen.

3.3.2 Runoff/Absorption
Existing Environment
Runoff and absorption are affected by amount of impervious surfaces, soil types for filtration, and amount of precipitation. According to the Western Regional Climate Center, the Bellingham area gets about 35 inches of rain per year. Much of the area inside the city is impervious pavement, rooftops, or yards, which contributes to runoff and pollution of storm water (Figure 3).

Impacts
Proposed Action:
Under the proposed ordinance nutrients from waste are not managed. Stormwater runoff will dissolve inorganic nutrients and transport them to streams, lakes, and marine waters causing dissolved oxygen problems, endangering wildlife, and violating water quality regulations.

Alternative 1:
The Alternative ordinance mandates the best management practices for waste. Composted waste releases nutrients more slowly and extra waste can be disposed of properly.

Alternative 2:
No significant impacts.

No Action Alternative:
Under the No Action Alternative urban chickens are allowed in the city of Bellingham. Because much of the surfaces within the city are impervious, extra nutrients from the waste will runoff into the stormwater system and end up polluting the streams, Lake Whatcom, Bellingham Bay, and Chuckanut Bay.
3.3.3 Floods
Existing Environment
Storm water from flooding runs into streams and ultimately Bellingham and Chuckanut Bays. It also runs into Lake Whatcom. The north end of Lake Whatcom is likely to be impacted by our proposal because it is within the city limits of Bellingham. Stormwater is an important non point source of pollution for Lake Whatcom, particularly Basin 1 (COB). In flood conditions, there is no opportunity for nutrient uptake by plants or for adsorption in soils.

Impacts
Proposed Action:
Under the proposed ordinance chickens will not be allowed in the Silver Beach neighborhood. This cuts down on the pollution to the public drinking water supply, but leaves streams, stormwater, and groundwater open for runoff from flooding to supply an excess of nutrients.

Alternative 1:
Alternative Ordinance number one may not protect against floods washing nutrients into streams. In the case of a large flood even waste that is being properly managed could still end up washing away into stormwater systems and therefore streams.

Alternative 2:
No significant impacts.

No Action Alternative:
Under the No Action Alternative chickens are allowed everywhere in the city of Bellingham, including the Silver Beach neighborhood. Lake Whatcom will be significantly impacted by waste nutrients in stormwater.

3.3.4 Groundwater
Existing Environment
Groundwater is protected under WAC 173-200. Groundwater also has water quality standards, most of which are standards for toxins. Residents of Bellingham do not receive drinking water from groundwater, but groundwater ultimately runs into streams, Lake Whatcom, Bellingham Bay, and Chuckanut Bay (Figure 4).

Impacts
Proposed Action:
Nutrients from poultry manure will leach through the permeable soils within COB and enter the groundwater aquifer.

Alternative 1:
Under Alternative Ordinance number one waste management is required. Composted manure leaches nutrients more slowly, regulating the influx to water supplies. Any excess nutrients will pollute groundwater more slowly and because of waste management practices fewer nutrients will enter the groundwater.
**Alternative 2:**
No significant impacts.

**No Action Alternative:**
Chicken waste is completely unmanaged. During precipitation events, nutrients can leach through permeable soils and infiltrate groundwater.

### 3.3.5 Public Water Supplies

**Existing Environment**
The public water supply for Bellingham is Lake Whatcom. Lake Whatcom is affected by pollution from land disturbances, including forestry and construction, and stormwater run-off from roads and residences. Pollutants in Lake Whatcom include PCBs, bacteria, and phosphorus. Bacteria, pesticides, and heavy metals have also been found in one or more lake tributaries.

As a result of large amounts of phosphorus in the lake, dissolved oxygen levels can become very low. Diminished oxygen in water threatens survivability of fish and other aquatic animals. While oxygen levels naturally decline over time as lakes mature, the lake’s aging process can be greatly accelerated by human influences. The aging—or eutrophication—of large healthy lakes is typically measured in thousands of years. But eutrophication can be accelerated and witnessed over decades when human influences cause major algal blooms. Naturally occurring in soil, phosphorus is a major ingredient in fertilizers and manure. Phosphorus can leach into waterbodies from soil erosion and from lawns when it rains. Too much phosphorus causes rapid growth of plants and algae that compete with salmon and other fish for oxygen when they decompose.

**Impacts**

**Proposed Action:**
The Silver Beach neighborhood, in the Lake Whatcom watershed, is protected by the proposed ordinance (Figure 5, Appendix 5.1.2). The ordinance will help limit the phosphorus influx into Lake Whatcom. Nitrogen and phosphorus will still significantly impact the stream watersheds and the Chuckanut and Bellingham Bay watersheds.

**Alternative 1:**
Alternative Ordinance number one provides more protection for the streams and marine waters by limiting chickens in critical areas. Nutrients will still leach into water supplies but this alternative provides the most protection without banning chickens.

**Alternative 2:**
No significant impacts.

**No Action Alternative:**
The current ordinance provides no protection for the Lake Whatcom Watershed. Excess phosphorus will continue to accumulate in the lake and cause algal blooms, further depleting dissolved oxygen and threatening fish and wildlife.
Figure 4. Watersheds within the city of Bellingham.
3.4 PLANTS AND ANIMALS

3.4.1 Habitat

Existing Environment

Fish Habitat: Although Bellingham and Whatcom County were once thriving with an overabundance of fish, these populations have been drastically diminished by changes in the environment due to sprawling urbanization as well as historical overfishing. Fish, like many other forms of wildlife, have very specific habitat needs. A viable habitat for fish living in the Pacific Northwest must include the following five attributes:

1. Cold temperatures.
2. Clean, Clear Waters.
3. An adequate food source
4. Habitat structural complexity.
5. Protected habitats (WCP, 1994)

Limitations to fish reproduction and development in Bellingham are primarily related to culvert blockages that limit access to habitat, degraded water quality and siltation from poor agricultural practices, low summer stream flows which limit rearing areas and increase water temperatures, and clearing of bank vegetation which degrades both spawning and rearing habitat (WCP, 1994). Lakeshore development degrades the foreshore environment for waterfowl as well as negatively impacts the water quality for adfluvial species of fish (WCP, 1994).

Wildlife Habitat: Bellingham provides a wide range of natural habitats which support and shelter a diverse array of wildlife species. Wildlife is particularly varied and abundant in Bellingham in comparison to other parts of Washington State because of the low to moderate urbanization and the large area which encompasses a wide range of natural ecosystems and habitats (WCP, 1994). Some of these ecosystems are considered “Priority Habitats” and as such hold unique or significant value to many species.

The encroachment of urbanization on wildlife habitats within the city of Bellingham necessitates the designation of all natural habitats as sensitive. However, under the GMA, critical habitat is specified by the following criteria:

- Areas with which endangered, threatened, and sensitive species occur.
- Habitats and species of local importance.
- Shellfish areas.
- Kelp and eelgrass beds.
- Naturally occurring ponds over twenty acres.
- Waters of the state.
- Lakes, ponds, streams, and rivers planted with game fish.
- State natural area preserves and natural resource conservation areas.
- Comparatively high wildlife density.
- High species richness.
- Significant wildlife breeding habitat.
- Significant wildlife seasonal ranges.
- Significant movement corridors for wildlife.
- Limited availability and or high vulnerability. (Eissinger, 1995)

*Marine Habitat*: Native eelgrass typically grows on sandy or muddy bottoms in the outer edge of the intertidal regions where the plants root-like rhizomes can weave throughout the substrate. Kelp and other macro-algae, however, generally prefer a rocky, stable substrate that they can adhere to. Both habitats support a diverse assemblage of species (WCP, 1994). Several types of epiphytic plants, as well as animals, have been known to live on eelgrass and kelp blades. A variety of small organisms thrive on the food sources found in or on the substrate in areas where eelgrass or kelp are present. These organisms, in turn, provide a food source to larger organisms such as crab, urchins, baitfish, flounder and salmon. And, according to the natural food-web, much larger deep-ocean species such as orcas, otters, and harbor seals also rely indirectly on eelgrass and kelp via the species of fish and crustaceans that use these areas for both cover and a source of food (WCP, 1994).

Baitfish present in Bellingham such as Pacific herring, Pacific sand lance, Surf smelt, and Longfin smelt are examples of small pelagic fish that serve an important role in the food chain. These fish provide important forage for predatory fish such as salmon as well as birds and other marine mammals. Both Pacific herring and Pacific sand lance deposit eggs in Bellingham’s shallow subtidal and intertidal zones Pacific sand lance are frequently taken as food by salmon while Pacific herring are often fed upon by diving birds and sea birds (WPC, 1994) Because of their obvious and important link in the food-chain, it is critical to maintain spawning and refuge habitats for all baitfish existing in Bellingham Bay.

Shellfish have historically been a natural and economic resource as well as a dietary staple for Puget Sound residents. Shellfish tidallands are susceptible to contamination from a number of sources including certain agricultural practices, failing septic drain-field systems and storm water runoff (WCP, 1994). The sources of human and animal waste that contaminate shellfish areas are often linked to source-points found at some distance from the shellfish area; sometimes along the shore or up a river or stream (WCP, 1994).

**Proposed Action:**
The proposed action would limit the degradation of Bellingham’s existing environment by restricting chickens to backyards and keeping them out of the streets, parks, and public spaces. However, chicken waste has the potential to runoff impervious surfaces and into nearby streams, lakes and the eventually will end up in Bellingham Bay. Any excrement that ends up in waterways via runoff has the potential to negatively impact critical habitat areas for sensitive or key species residing in Bellingham.

**Alternative 1:**
Alternative 1 would prevent extensive environmental degradation by limiting the number of chickens allowed and by requiring that all chickens remain confined. With the implementation of required proper waste management strategies, the alternative ordinance would significantly reduce the harmful effects of waste being
produced by chickens in currently in Bellingham. Overall, the most harmful effects of owning chickens would be mitigated by the implemented management practices and the resulting impact would be minor to non-existent.

**Alternative 2:**
By severing all privileges to chicken ownership within the city limits of Bellingham, Alternative 2 would significantly increase all habitat areas in and around the city including critical and conservation areas.

**No Action Alternative:**
Taking no action leaves the opportunity for significant environmental degradation to continue to increase without check. With no restrictions on the number of chickens or the degree of sanitation in which they live or a required containment, chicken populations will continue to increase thereby continue to pollute Bellingham’s waterways and wildlife habitat areas.

### 3.4.2 Biodiversity
**Existing Environment**
Whatcom County and Bellingham in particular possess a richly abundant and diverse variety of vertebrate species. These species range from amphibians, reptiles, birds, and smaller mammals to larger and potentially more economically important groups such as waterfowl, raptors, ungulates, marine mammals, wild cats, and bears (WCP, 1994).

Some land-living species such as the coyote, American crow, raccoon, and black-tailed deer are species that can thrive in a wide range of habitats from urban to forest areas. These species are widely distributed in the Pacific Northwest and tolerate or even benefit from land development (WCP, 1994). Other species such require specific habitats and cannot survive with even a low degree of human influence or habitat disturbance. The Townsend’s big-eared bat, Peregrine falcon, pileated woodpecker, hooded merganser, elk and marten are examples of species in Bellingham that are considered “habitat specialists” and may be declining in population throughout the state (WCP, 1994).

Bellingham stream systems and water basins support a variety of economically and ecologically important fish species. Streams that run through the City of Bellingham originate outside the city limits, but within Whatcom County. Fish species found in Whatcom County drainages include the following: Chinook, Coho, Chum, Pink and Sockeye salmon; Costal and West slope cutthroat, Golden, Rainbow, Brook, and Bull trout; Dolly Varden char, Kokanee, Mountain Whitefish and Green sturgeon. None-native species, such as Largemouth and Smallmouth bass, Bluegill, Black crappie, Brown bullhead and Channel catfish as well as Eastern brook char are important fish for recreation (WCP, 1994). A full list of fish species and habitat location can be found in Table 3, Chapter 6.2.

Lists of vertebrate species occurring within the City range from guess work to scientifically based sampling records. Of the vertebrate groups occurring locally, the
only complete existing list is for birds. Few systematic wildlife studies have been conducted within the City. These include short term bird related surveys and counts, faunal inventory of Sehome Hill, Padden Creek Estuary, and the Chuckanut Ridge development and city wide stream surveys for fish. The majority of scientific field work in the city has involved fish (Eissinger). An extended list of all documented species can be found in Ann Eissinger’s Wildlife and Habitat Assessment Appendix C, as found on the City of Bellingham website.

Invertebrates were not disregarded for lack of value or posterity. On the contrary, invertebrates form the foundation for the food pyramids of all ecosystems and are important bioindicators for water quality, air quality and landscape deterioration (Jeffery & Madden 1991). The time and space required to properly address invertebrates was beyond the resources available for this report (Eissinger).

Impacts

Proposed Action:
The proposed action would restrict chickens to backyard enclosures in urban areas. This would prevent chickens from wandering into critical areas and directly polluting wildlife habitat conservation areas via excrement. This will be beneficial to the potentially endangered or protected species living in these protected areas. However, as wildlife is inextricably linked to the habitat in which it resides, any chicken waste produced that has the potential to runoff impervious surfaces and into nearby streams, lakes and the Bay, has the potential to negatively affect the biodiversity in these areas. The affected wildlife in these areas may influence wildlife elsewhere in Bellingham that depends on a readily available source of food.

Alternative 1:
Alternative 1 would preserve biodiversity by limiting nutrient overloading. It would limit the loss of local flora and fauna due to excess nutrients by enforcing responsible and proper waste management practices for residents that own chickens. The ordinance would also acknowledge critical areas and require that permits be acquired to ensure full disclosure of chicken ownership within the city. This would allow for records to be kept of the history of the land use and provide data for future scientific studies. Alternative 1 also restricts the number of chickens that may be owned per acre. This would limit the extent to which chickens could affect groundwater and runoff nutrients. The overall negative effects would be minor to nonexistent.

Alternative 2:
Alternative 2 would restore biodiversity in Bellingham by forbidding ownership of chickens within city limits. No chickens in the city would mean that the likelihood of nutrient overloading and runoff would be reduced to zero. The likelihood of chickens wandering into critical areas or wildlife habitat conservation areas would also be reduced to zero. A restriction on chickens would result in no degradation of any habitat related to any species in Bellingham. This would clearly be beneficial to endangered or protected species in many ways.
**No Action Alternative:**
Taking no action would allow continued unrestricted chicken ownership in Bellingham. As sanitary conditions are required for chicken living conditions but not specified in the current ordinance, there is potential for unchecked instances of unsanitary conditions within the city that would allow for extreme pollution and degradation of the environment. With no restrictions and no specifications as to proper waste management or confinement, chickens could potentially wander into nearby conservation areas and pollute these areas. With no restriction as to how many chickens can be owned, the possibility of environmental habitat pollution and the risk for endangered species is limitless.

**3.4.3 Unique Species**

**Existing Environment**
Species of Concern are those species which have been identified by resource agencies and scientists to be “at risk” and whose status is currently either under review or has been confirmed to be endangered or threatened and is protected under the Endangered Species Act. It also includes those species listed as State Endangered, State Threatened, State Sensitive, or State Candidate as well as species listed or proposed for listing by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service (WDFD site). Locally significant species tend to be specialists, historically common and indigenous to the area (Eissinger). A list of locally significant species as well as species of concern including federal and state endangered, threatened, candidate and proposed species as well as state PHS species can be viewed in Table 2.

**Impacts**

**Proposed Action:** The proposed action would prevent chickens from wandering into potentially critical habitats of sensitive species but it would not completely prevent chicken wastes from ending up in these areas. Runoff over impermeable surfaces would easily spread harmful bacteria from chicken waste into nearby critical habitats whether it is a stream, riparian or a forested area.

**Alternative 1:** Implementing Alternative 1 would provide more protection for endangered species than the proposed action by not only requiring chicken confinement but by also restricting the number of chickens that one may own. By implementing BMPs, chicken owners would be required to properly manage chicken wastes. This would mitigate any negative impacts related to chicken waste. The overall negative impact of owning chickens would thus be eliminated.

**Alternative 2:** Alternative two would maximize protection for protected and endangered species by not only forbid ownership of chickens but by removing any existing chickens as well. This would significantly improve environmental conditions for wildlife in Bellingham; especially for endangered, threatened or locally significant species.

**No Action:** With no restrictions on numbers or confinement of chickens, protected and endangered species are at risk of habitat loss due to pollution.
3.4.4 Fish Migration Routes

Existing Environment
As stated above, Bellingham is home to a variety of fish species. Over sixteen species of fish are found in the fresh water streams and lakes of Bellingham. Of these, twelve are resident species and six are anadromous (migratory); thirteen are native species and six have been introduced. Of the native anadromous fish only the pacific lamprey and sea-run cutthroat populations are completely wild or untainted by hatchery stock, however remnant populations of wild salmon and steelhead may still occur in the Chuckanut watershed (Eissinger).

The maps below show local species of fish and their migratory routes through the City of Bellingham. Each map shows a different species of fish and their respective known spawning grounds.

Impacts

Proposed:
The proposed action would result in similar if not identical protection for fish as for biodiversity in general as well as for protected species. Overall, the impacts of owning chickens within city limits would be slightly negative.

Alternative 1:
Alternative 1 would provide mitigation to prevent chicken waste from entering streams and lakes and would hopefully incur little or no negative effects to fish-bearing streams.

Alternative 2:
Alternative 2 would maximize protection for fish rearing and spawning in Bellingham lakes and rivers by restricting chicken ownership to outside city limits. By removing any chickens existing within city limits, this improves the habitat quality for wildlife and fish in Bellingham.

No Action:
The no action alternative would allow for extensive stream habitat pollution which could lead to redd termination and significant declines in fish populations.
Figure 5. Chinook stream use and spawning areas in Bellingham, WA.
Figure 6: Chum stream use and spawning areas in Bellingham, WA.
Figure 7. Coho stream use and spawning areas in Bellingham, WA.
Figure 8. Steelhead stream use and spawning areas in Bellingham, WA.
Figure 9. Trout stream use and spawning areas in Bellingham, WA.
Figure 10. Vegetation cover within the city limits of Bellingham. Cover is represented in height of vegetation.
4.1 ENVIRONMENTAL HEALTH

4.1.1 Noise
Existing Environment
The primary noises associated with backyard chickens are attributed to roosters. Roosters are undesirable within neighborhood settings because they often crow early in the morning and wake up neighbors. Hens can also make a disturbing level of noise as they lay eggs. However, this is usually at a more reasonable time of the day when people are less likely to be home and daytime activity obscures the clucking sounds. In 2009 the Whatcom Humane Society received 206 complaints regarding livestock nuisances, mostly concerning roosters (Whatcom Humane Society, personal communication with Laura Clark).

Impacts
Proposed Action: The Proposed Action would confine chickens within coops preventing them from making noise in public areas and on neighboring properties. However, roosters, which are the noisiest chickens, would still be allowed so this proposal would have a significant adverse impact on noise.

Alternative Action 1: Alternative Action Number One restricts chickens to coops and would reduce the noise in unwanted areas. It is unlikely that the number of chickens currently in Bellingham would decrease. But, by restricting the number of chickens allowed per acre, this ordinance would prevent numbers of chickens and their respective noise level from growing exponentially. In addition, roosters would be banned, reducing the amount of noise made early in the morning. The noise levels that would result from this alternative would result in a minor adverse impact.

Alternative Action 2: This alternative would eliminate the impacts from all chicken-related noise.

No Action Alternative: Under this ordinance, free range (no confinement) chickens and roosters will continue to make noise wherever they go. As the number of chickens continues to increase in Bellingham, the noise associated with them will increase as well. As the noise levels increase, the No Action Alternative would present a significant adverse impact to noise levels.

4.1.2 Risk of Explosion
Existing Environment
Composting manure can release flammable gases. The gases of concern are hydrogen sulfide and methane (Discussed in Air Section 4.4). Accumulation of these gases occurs when temperatures in manure are high under anaerobic conditions in manure storages or poorly ventilated buildings. On backyard farms, anaerobic conditions can develop when rainwater and runoff mixes with manure. Explosions can result when these gases come into contact with an open flame (Ogejo 2009). Generally, it takes composting manure from thousands of chickens (as in CAFOs) for this to become a significant risk.
**Impacts:**

**Proposed Action:** Hazardous flammable gases are only released in anaerobic spaces such as compost bins saturated with water. This ordinance does not mandate compost; however, our informal survey of Bellingham chicken owners indicated that most owners are choosing the compost waste on their own. Because this Proposed Action does not prevent rain water and runoff from saturating compost, it is possible that many chicken owners are composting waste under anaerobic conditions. As the amount of compost increases, the risk of flammable gas release would increase as well. However, even under these conditions, it is unlikely that enough compost could accumulate at a backyard chicken farm to cause a major problem so this proposal only presents a minor adverse impact to the risk of explosion.

**Alternative Action 1:** Alternative Action Number One forces chicken owners to compost their chicken waste and this compost could result in the release of flammable gasses. This ordinance would also limit the amount of chickens allowed per acre, and require rain water and runoff to be diverted from waste which would decrease the likelihood that anaerobic conditions could develop. This limitation would make the likelihood of manure accumulation and flammable gas release minimal. The negative impacts associated with this alternative would be minor and less than the possible impacts associated with the proposed action.

**Alternative Action 2:** This alternative would eliminate all chicken waste so there would be no possibility of an explosion.

**No Action Alternative:** The impacts associated with the No Action Alternative are the same as impacts of the Proposed Action.

**4.1.3 Releases to the Environment Affecting Public Health**

**Existing Environment**

Manure from chickens contains multiple types of bacteria harmful to humans. Most of these pathogens are waterborne and once they enter groundwater or streams they can spread throughout the water system and make water unsafe for human contact (Whatcom County Government 2010). The most common bacteria in manure linked to human outbreaks are fecal coliforms like E.Coli (Escherichia coli) and *Salmonella*. Other less common threats include *Campylobacter*, *Cryptosporidium* and *Listeria* (CDC 2005). Humans could also become sickened through improperly composted manure placed on vegetable gardens.

Avian Influenza (AI) Virus is spread among poultry and other fowl through contact with the fecal matter of infected birds. AI can be spread to humans as a deadly form of the flu (World Organization for Animal Health). While much less common than fecal coliforms, an outbreak of this highly pathogenic disease would have much more severe consequences for the population of Bellingham. The risk of an AI outbreak is much greater when chickens live in free-range systems (no confinement) because they can wander into areas inhabited by waterfowl, which are known carriers of the virus. If one chicken were to become infected, a free
range system would also lead to a more rapid spread of the virus because chickens from neighboring flocks could interact and pass the virus on (Biswas et al 2009).

**Impacts**

**Proposed Action:** The Proposed Action would require chickens to be confined within a coop eliminating chicken manure from unwanted public areas and private property. This proposed ordinance would not control manure accumulation within the coops or prevent water runoff from flowing through these structures and into surrounding water bodies. With any rain pathogens released from the manure accumulating on the ground could be washed off into the nearest waterway. As the numbers of chickens in Bellingham increased, the waterways would become more polluted with fecal coliforms creating a significant risk for humans in contact with the water. In addition, coops would limit contact between wild birds and chickens and minimize the likelihood of an AI outbreak. Despite the mandated coops, this ordinance would still allow a considerable release of pathogens into the water, creating a significant adverse impact on public health.

**Alternative Action 1:** Alternative Action Number One would limit the number of chickens allowed per acre and require all chickens to be confined in a coop. By stipulating that owners must collect and compost fecal waste, exposure to pathogens would be greatly reduced. Composting some of this waste would kill the pathogens in chicken manure due to the high temperatures that are created inside compost piles (CDC 2005). Also, the required diversion of runoff away from chicken coops helps to reduce the spread of pathogens through waterways. The amount of pathogens being spread throughout the city would greatly decrease compared to the No Action Alternative and the Proposed Action. Since this ordinance requires chicken owners to obtain a permit from the Humane society the location of all chickens within the city would be known. If an AI or similar viral outbreak were to occur, the city could contain the threat rapidly by exterminating and properly disposing of all the chickens in the area. The small possibility of disease through contaminated eggshells and direct contact with chickens presents a minor adverse impact to public health.

**Alternative Action 2:** This ordinance eliminates chickens altogether so there would be no risk of hazardous materials being released.

**No Action Alternative:** The existing ordinance allows chickens to remain unconfined, spreading manure around neighborhoods and into waterways. Under these conditions the spread and extent of pathogens is very high. As chicken numbers continue to increase in the city, incidental human exposure to these waste-related pathogens will increase as well. The intermingling of chickens and various wild birds will increase the likelihood of an AI outbreak. The risk of an AI outbreak is much greater when chickens live in free range systems because they can wander into areas inhabited by waterfowl. Under this ordinance, as chicken numbers grew unconfined, disease transmission would be the greatest with the No Action Alternative.
4.1.4 Watershed
Existing Environment:
Manure contains elements which make it a very serious pollutant and any discharge will most likely violate local, state, or federal regulations, resulting in fines or other penalties. In the last few years, development companies, contractors, excavators and other farmers have been fined by the Department of Ecology (DOE) for seemingly minor violations, especially within the Lake Whatcom watershed. Muddy water released into the bay and irrigating without a permit are some of the infractions being enforced by fines up to $10,000. A DOE inspector recently stated, “When it’s our drinking water source, even small problems...we are dedicated to preventing (Fraley 2010).” Chicken manure presents problems comparable to many of these practices regulated by the DOE.

The health of a watershed is determined through a variety of factors including water quality, species presence, and vegetation. The specific consequences of runoff into water bodies are discussed in the Water Section of this document (Water section 3.3). The specific consequences for species within the watershed are discussed in the Plants and Animals Section of this document (Plants and Animals section 3.4).

Impacts
Proposed Action: The Proposed Action will prevent chickens from wandering into waterways and depositing manure. However, nutrients and pollutants in manure would still be susceptible to entering waterways through runoff. This proposal would have a significant adverse impact on the watersheds.

Alternative Action 1: Like the Proposed Action, coops will prevent chickens from wandering across waterways. In addition, nutrients and pollutants in manure would be reduced through the limited number of chickens allowed per acre and implementation of BMPs (Best Management Practices). This ordinance will not reduce the number of chickens that exist in Bellingham now however, so there will still be a minor adverse impact on the watershed.

Alternative Action 2: With the implementation of Alternative Action Number Two, all chickens will be removed. Any chicken-related watershed degradation that is currently occurring would be eliminated. Therefore Alternative Action Number Two would have a minor positive impact on watersheds.

No Action Alternative: The No Action Alternative will have very negative impacts on the health of the watershed because chickens may leave waste throughout the city and in any waterways including tributaries to Lake Whatcom. This is not allowed in the Critical Areas Ordinance (appendix) which is enforced by the DOE. The associated decline in water quality would create a significant adverse impact on the environment.
4.2 LAND AND SHORELINE USE

4.2.1 Land Use and Zoning

Existing Environment

Bellingham’s population is expected to increase from its current size of 80,000 people to nearly 115,000 people by 2022. For many people moving to Bellingham one of the appeals is the traditional farming community feel. For some, this sentiment might stem from having chickens in their backyard. In one response in our informal survey of Bellingham Chicken owners, Elizabeth Jennings described one of her reasons for owning chickens:

It's a community-building activity. Our coop is between our house and sidewalk, in full view of all who walk or drive by. We have met so many people who live in the area and now we know them by first name, because they stop to ask about the chickens. Also, in the summer we have excess eggs, so share them with neighbors. Several families bring their kids by every day on walks or on the way to the playground to visit the chickens.

This response was similar to those of many of the chicken owners in our survey and represents the importance of chickens to many residents.

The Land Use Chapter of Bellingham’s Comprehensive Plan is intended to help maintain and enhance Bellingham’s sense of community and quality of life. Land uses in each of Bellingham’s 23 neighborhoods (Figure 5) are different, and contained within individual neighborhood plans. Currently, there are no neighborhood plans that address chicken ownership.

Impacts

Proposed Action: This Proposed Action is in compliance with goals of the Land Use Section of the city of Bellingham Comprehensive plan. This ordinance would allow households to continue to own chickens, as long as they were confined within coops. The community aspects of Bellingham that have developed around chickens would not be affected. This would likely not have a significant impact on the farming sentiment of Bellingham, especially since keeping chickens in coops is a common practice, even without this ordinance. This proposal would have a minor adverse impact on the land use and zoning.

Alternative Action 1: The impacts of Alternative Action Number One would be the same as the impacts of the Proposed Action. An additional impact of this alternative might occur from having to limit the number of chickens per acre. The backyard farm feeling might be reduced slightly if people who currently own more chickens than would be allowed with this ordinance had to reduce the size of their backyard flock. In this case this alternative action would have a minor adverse impact on the land use and zoning.

Alternative Action 2: Because this alternative eliminates chickens in Bellingham, the land use of all neighborhoods would no longer include backyard chicken
farming. Any chicken-related farming sentiment in Bellingham would be eliminated. This alternative would have a significant adverse impact on the land use and zoning.

**No Action Alternative:** The No Action Alternative would allow Bellingham’s chicken population to remain in its current state. Chickens would continue to be allowed in all neighborhoods, unrestrained. The No Action Alternative would have no impact on the current land use and zoning of Bellingham.

### 4.2.2 Light and Glare

**Existing Environment**

Currently there are no requirements mandating chicken owners to build chicken coops. However, according to the responses in our survey many owners choose to build coops on their own. There are no construction restrictions for these coops so they could be built from any type of material. If a coop was built out of sheet metal, it would most likely create a light issue for the neighbors. We did not find any specific examples of complaints regarding coops that altered light to neighboring properties in Bellingham.

**Impacts**

**Proposed Action:** The Proposed Action requires a coop structure but does not place any restrictions on how this coop can reflect light. It is possible that coops would reflect or block light on neighboring properties in an undesirable way so this proposal would have a minor negative impact compared to the existing situation.

**Alternative Action 1:** This alternative ordinance requires owners to house their chickens in coops. The size and height of these coops is restricted to eliminate excessive glare and light blockage. But, these required coops must be covered using any material such as sheet metal. If a coop were to be covered with sheet metal there would be a definite change in the light and glare of a property. Theses mandated covered coops would create a minor negative impact on light and glare.

**Alternative Action 2:** This alternative would eliminate any structures necessary for housing chickens. Any glare or light issues that these structures create, would be eliminated so this action would have a minor positive impact on the existing light- and glare-related issues.

**No Action Alternative:** Under the No Action Alternative, owners would continue to build chicken coops with no restrictions. The No Action Alternative would have a minor adverse impact on light and glare.

### 4.2.3 Aesthetics

**Existing Environment**

Despite the increasing popularity of chickens in the U.S., not everyone wants to see chickens in their backyard. Backyard chickens bans recently put into place in some U.S. cities were spurred by large contingents of people who saw chickens as “filthy, annoying and unwanted pests” (USA Today article). Contrary to this, our informal
survey of Bellingham chicken owners indicated that chickens are considered fun family pets by their owners and neighbors alike. These contrasting opinions show that the aesthetic appeal of chickens in neighborhoods is very subjective.

The algal blooms associated with nutrient overloading (discussed in the Water Section 3.3.1 of this document) can also create aesthetic issues.

**Impacts**

**Proposed Action:** The coop required by the Proposed Action would prevent chickens from accessing private and public property where they are not wanted while still allowing people who do enjoy chickens to own them. This coop would reduce unwanted waste accumulation on properties except where chickens are owned. It is possible that this coop would create an aesthetic issue for some residents. This ordinance has no limitations as to how large the coops could be or what materials the coops could be built from. Ramshackle coops may be unappealing for neighbors to look at, but an improvement from having to look at unwanted chickens and waste accumulations in their own backyards. This proposal would have a minor positive impact on aesthetics.

**Alternative Action 1:** Like the Proposed Action, the coops mandated in Alternative Number One would prevent chickens from wandering onto private and public property where they are not wanted. To reduce the aesthetic impact of this requirement, this ordinance limits the maximum height and area of the coops. An additional aesthetic impact created by this ordinance is the required compost structure. Like the coop restrictions, this compost structure has a limit on how large it can be. Besides size this alternative does not limit the appearance of the coop or compost structures. Decrepit structures would be undesirable for neighbors to look at. This alternative would have a minor adverse impact on aesthetics.

**Alternative Action 2:** This alternative would eliminate any aesthetic impacts related to chickens so there would be a minor positive impact from the existing situation.

**No Action Alternative:** The No Action Alternative would continue to allow chickens to access neighboring properties leaving unwanted waste behind. This would continue to be a problem for Bellingham residents who do not want chickens around. As the chicken population increased, more opposition would ensue from neighbors opposed to chickens. The No Action Alternative would have a significant adverse impact on the aesthetics.

**4.2.4 Recreation**

**Existing Environment**

Many water bodies in Whatcom county and Bellingham are a mecca for sports fisherman, river rafters and other watersport enthusiasts. The Whatcom County tourism website boasts, “Exhilarating raft trips on the Nooksack River, salt and freshwater beaches, fishing and kayaking.” These watersports can become seriously impaired with declining water quality that is associated with chickens (discussed in Water Section 3.3 of this document and Environmental Health Section
4.1. If these bodies were to become polluted with pathogens from chicken manure, humans recreating could become sick through contact with the water.

The quality of these waterways is regulated, partially to protect water-based recreation by several WAC regulations; the State Waste Discharge Permit Program (Appendix, 5.1.10), the Water resources act of 1971 (Appendix, 5.1.8), the Water pollution control act (Appendix, 5.1.7).

**Impacts**

**Proposed Action:** This proposal would confine chickens and prevent them from contaminating waterways directly. However, the number of chickens in Bellingham would continue to increase and waste would continue to enter into bodies of water indirectly via runoff. Through water-based recreation, human contact with waste-related pathogens would increase. Also, the aesthetic degradation associated with algae blooms would deter people from water based recreation. As discussed in the Water Section (Chapter 3.3) of this document, algae blooms cause deleterious impacts on fish and would have an impact on sports fishing. This proposal would have a minor adverse affect on recreation in Bellingham.

**Alternative Action #1:** Like the Proposed Action this alternative would confine chickens and prevent them from contaminating the waterways. In addition, this ordinance would prevent the numbers of chickens from growing exponentially, and use BMP's to mitigate problems associated with their waste to prevent the associated deterioration of water quality. This proposal would have a minor adverse impact on the environment.

**Alternative Action #2:** Alternative Action Number Two would eliminate chicken waste and improve the quality of water for water-sport enthusiasts. There would be a minor positive impact on recreation in Bellingham.

**No Action Alternative:** The No Action Alternative would continue to allow chicken numbers to grow within the city and the water quality to deteriorate. Eventually, it is possible that the hazards associated with recreating in the water could become so great that these water activities could not continue. The No Action Alternative would have a significant adverse impact on the environment.

**4.2.5 Agricultural Crops**

**Existing Environment**

When composted properly manure can be the best fertilizer for crops. It contains excellent sources of nitrogen and phosphorus, which are necessary for plant health. Composted manure can increase the water-holding capacity of soils, improve drainage in fine-textured clay soils, provide a slow release of nutrients, reduce wind and water erosion, and promote the growth of beneficial soil organisms. When manure is composted improperly, it can be a significant source of contaminated runoff and crop contamination (Whatcom Conservation District 2009).
Unfenced chickens getting into gardens could create problems as well. Chicken waste may contain significant amounts of disease-causing bacteria harmful to crops and humans eating the crops.

Unfenced chickens can also cause problems in gardens by eating plants and seedlings.

**Impacts**

**Proposed Action:** The mandatory confinement structure required in the proposed ordinance would prevent chickens from depositing waste directly onto crops. Coops would also prevent chickens from defecating into streams that are potential sources of irrigation to downstream crop areas and gardens. Even with coops, however, this action has no requirements for managing chicken waste accumulations of manure within the coops. So, chicken waste would mix with storm run-off and spread through soils into groundwater and streams, which could affect crop irrigation. This action would have a significant adverse impact on agricultural crops.

**Alternative Action 1:** Like the Proposed Action, the confinement structure will prevent chickens from depositing waste directly onto crops and into streams. In addition, the compost stipulations will encourage owners to develop compost piles, which could be distributed onto gardens to build up soil rich in nutrients and earthworms. Although this ordinance does encourage BMPs for composting, it would be very difficult to regulate, and there is a chance that compost would be improperly applied to crops and cause damage to the crops or sickness to people eating the crops. Unlike the Proposed Action, however, people would be aware that manure based fertilizer was present in their gardens and wash their crops before consuming them. Overall, this action would have a minor positive impact on agricultural crops.

**Alternative Action 2:** The removal of all chickens from Bellingham would eliminate all of the negative impacts caused by direct waste deposit onto crops. However, it will also eliminate the positive impact of composted waste being adding to the rich soil in gardens, so this alternative would have no impact on agricultural crops.

**No Action Alternative:** The No Action Alternative would allow manure accumulation to increase throughout gardens and irrigation sources without the knowledge of farmers and gardeners whose crops would be affected. Incidental human exposure to these contaminants would increase as well. In addition, chickens would be able to eat plants and seedlings in unfenced gardens. Overall, this alternative would have a significant adverse impact on agricultural crops.
Figure 11. Neighborhoods within the City of Bellingham
5.1 KEY PLAYERS

Washington State Department of Ecology

The mission of the Department of Ecology is to protect, preserve, and enhance Washington’s environment and promote the wise management of our air, land, and water for the benefit of current and future generations. In order to fulfill that mission the Dept. of Ecology has three goals:

- Prevent pollution
- Clean up pollution
- Support sustainable communities and natural resources

For more information visit: http://www.ecy.wa.gov

United States Department of Agriculture

The USDA participates in environmental policy decisions, provides information about soils, irrigation, water supply, water quality, and plants and animals.

For more information visit: http://www.usda.gov

Whatcom County Humane Society

Whatcom County Humane Society handles all complaints about livestock behavior, odor, and noise. They may also be able to provide education on proper care of urban livestock.

For more information visit: http://www.whatcomhumane.org

Whatcom Conservation District

Whatcom Conservation District is dedicated to serving present and future generations of Whatcom County through a natural resource conservation program of leadership, partnership, technical, educational, and financial assistance to foster a healthy, sustainable relationship between people and the environment.
5.2 ORDINANCES AND REGULATIONS

5.2.1 Existing Ordinance

Bellingham Municipal Code
An Ordinance Regulating the Keeping of Fowls and Animals; And providing penalties for the violation thereof

B. No one within the City of Bellingham may keep any fowls or animals unless the places where they are kept shall be at all times maintained in a sanitary condition and this condition shall be determined by the local Health Officer or his duly authorized representative having jurisdiction in the city of Bellingham. When the said local Health Officer shall notify the owner of such fowls or animals that the place or places where the said fowls or animals are kept is unsanitary, the party so keeping same may have five days in which to place the same in a sanitary condition in accordance with the direction of the said City Health Officer and if they are not placed in a sanitary condition within the five days the places may be abated as a nuisance.

B. That any party failing or refusing to comply with the orders of the Health Officer above mentioned, when in fact an unsanitary condition does exist, shall be deemed guilty of misdemeanor and on conviction thereof shall be fined not to exceed One Hundred Dollars ($100.00) or imprisoned in the City Jail not to exceed thirty (30) days, or may be punished by both such fine and imprisonment.

5.2.2 Proposed Ordinance

City of Bellingham Municipal Code
7.12.060 – Keeping Animals in the City

A. Any person being the owner or entitled to the possession of any animal of the species of horse, mule, ass, cattle, sheep, goat, domesticated fowl and exotic animals (except domesticated fowl maintained in a residence), including but not limited to, duck, chicken, goose, turkey or peafowl or swine of any kind, shall be permitted to keep the same within the limits of the City except as the same is now or may be hereafter prohibited by ordinance, by securely confining the same in a stable or other building; or an enclosure surrounded by a secure, well-built fence of sufficient height and strength to confine such animal therein; or the same may be securely staked out in a vacant lot in such manner that it cannot get upon any street, alley, or other public place within the City provided that the same is so confined or staked out as to effectively prevent it getting near enough to the property of another to do any damage thereto or commit any nuisance thereupon; and provided, further, that any such animal shall be considered as running at large when it breaks away from its fastenings or is herded or permitted to feed upon any
of the streets, alleys or other public places of the City.

B. Hives or colonies of bees shall be kept in a manner in which they are inaccessible to the general public and so that bee movements to and from the hive do not interfere with the ordinary movements of persons on adjacent properties or the public right-of-way. Hives shall be located at least 50' from the nearest property line. All colonies must be registered with the Director of the Department of Agriculture of the State of Washington as provided in RCW 15.60.030. The terms "hive", "colony", "colonies of bees" and "bees" as used in this section shall have the meanings set forth in RCW 15.60.005.

C. All stables and other buildings and all enclosures and premises upon which any such animals are kept and confined shall be kept in a clean, healthful, and sanitary condition by the person owning, possessing, or using any such premises for said purposes; and no persons owning, possessing, or using any such premises shall permit any nuisance to be formed or to accumulate thereon.

D. It is the duty of the animal control authority to inspect all premises whereon any such animals are confined or kept, and to enforce the regulation of this chapter. If any such premises are not kept in the manner provided in this chapter, such officer of officers shall at once notify the persons owning, possession, or using the premises for such purpose to place the same in a safe, secure, clean, healthful, and sanitary condition, and such person shall forthwith comply with such order.

E. Any person violating any of the provisions of this section shall be deemed guilty of an infraction and upon conviction thereof shall be fined in any sum not to exceed $250.

16.80.060 – Residential Permitted Uses in the Lake Whatcom Reservoir

A. Animal husbandry including the breeding, rearing or keeping of livestock such as, but not limited to, cattle, bison, horses, mules, ponies, donkeys, llamas, alpacas, sheep, goats, pigs or poultry shall not be permitted. Except, properties at which animal husbandry is currently being conducted as of the effective date of this Lake Whatcom Reservoir Regulatory Chapter may be permitted to continue at existing sites, provided the existing use shall not be expanded, enlarged or increased in intensity by any means nor shall animals be replaced due to death of an animal. It shall be the property owner's responsibility to obtain a Certificate of Nonconforming Use and provide evidence that such use was established, including the specific type and quantity of animal(s) as of the effective date of this chapter. The Certificate of Nonconforming Use shall not be transferable to another person or entity.
5.2.3 Alternative #1 Ordinance  
(Developed by the Urban Chickens EIA team)

A. Any person who keeps chickens in the City of Bellingham shall obtain an annual license prior to January 1 of each year, or within 30 days of acquiring the chickens. The license year commences on January 1 and ends on the following December 31. Application shall be made to the Department of Ecology and the fee for the license shall be ten dollars ($10.00), regardless of the number of chickens.

B. No more than 1 chicken per 0.05 acres will be allowed.

C. Chickens must be confined away from riparian areas and critical areas at all times as specified in the Critical Areas Ordinance (Chapter 16.16 of the Whatcom County Code).

D. Best management practices (BMP) must be applied with regards to waste management, confinement structures, and nuisance mitigation.

   i. Waste Management: Manure and soiled bedding from stalls and paddocks must be removed and placed in a storage area protected from rainfall so that runoff does not carry pollutants and bacteria to water ways (WCD).

   ii. Confinement Structures: Chickens must be kept within a covered area no larger than three (3) square feet per chicken. If fewer than four (4) chickens are owned, the coop may be up to nine (9) square feet. This structure is not to exceed ten (10) feet in height and cannot be located closer than 15 (fifteen) feet from the adjacent property. An absorbent groundcover (bedding), including but not limited to, sawdust, straw, shredded newspaper, shavings or wood pellets must cover the ground in order to help absorb liquid and solid fecal matter. This cover must be replaced kept clean and sanitary so it does not release odors to neighboring properties. Soiled bedding must be treated the same as manure, and composted regularly. Also, any other impervious surfaces on the property must use roof runoff structures to divert excess runoff away from the chicken confinement area.

   i. Compost: Separate structures must be built to hold composting waste and bedding. These structures must be built on an impervious surface and covered at all times in order to eliminate runoff of nutrients and harmful bacteria in storm water. Like the confinement structures, runoff water from other impervious surfaces should be diverted from the composting waste. To help develop a suitable sized compost bin, it should be considered that one chicken produces approximately 0.11 cubic feet of waste per month, but the structure should not exceed the size of the coop.
iii. Nuisance Mitigation:
   i. No roosters will be permitted.
   ii. All stables and other buildings and all enclosures and premises upon which any such animals are kept and confined shall be kept in a clean, healthful, and sanitary condition (Bellingham Municipal Code 7.12.060).

E. Any person violating any of the provisions of this section shall be deemed guilty of an infraction and upon conviction thereof shall be fined $250.

5.2.4 Alternative #2 Ordinance
(Developed by the Urban Chickens EIA team)

A. No chickens are allowed within the city limits of Bellingham.

B. Any violations will punishable by a fine up to $250.
5.2.5 Whatcom County Code: CPAL, (Chapter 16 Appendix A)

**Purpose Statement**

The well-being of farms and ranches in Whatcom County depends in part on good quality soil, water, air and other natural resources. Agricultural operations that incorporate protection of the environment, including critical areas as defined by this chapter, are essential to achieving this goal.

**Overview**

A conservation farm plan identifies the farming or ranching activities and the practice(s) necessary to avoid their potential negative impacts (resource concerns). Practice selection depends upon the types of livestock raised and crops grown. Based upon the type and intensity of the operation, some generalizations can be made as to the resource concerns and remedies that apply.

Some operations present relatively low risks to critical areas because of their benign nature, timing, frequency, or location. For these operations, the resource concerns and remedies are relatively easy to identify and implement. These are described in more detail as low-impact agricultural operations subject to standardized farm conservation plans in Section 1 below.

Where the potential negative impacts to critical areas are moderate or high, solutions are more difficult to formulate and implement. In those circumstances, a more rigorous planning process is required. In such cases, a formal written plan shall provide the desired environmental protection. These types of operations are described as agricultural operations requiring custom farm conservation plans in Section 2 below.

Farm conservation plans prepared pursuant to Section 1 or 2 shall include all reasonable measures to maintain existing critical area functions and values.

**Section 1. Low-Impact Agricultural Operations Subject to Standardized Farm Conservation Plans**

These operations present a low potential risk to critical area degradation including ground/surface water contamination because the animals kept generate fewer nutrients than can be used by the crops grown there.

1. **Criteria.** To qualify as a low impact operation, a farm shall not exceed one animal unit per one acre of grazable pasture. One resource for guidance is “Tips on Land and Water Management for Small Farm and Livestock Owners in Western Washington.” It can be obtained at: http://www.kingcd.org/pub_sma.htm or from the Whatcom conservation district. Other guidance may also be used, provided it is consistent with the best available science criteria in WAC 365-195-900 through 365-195-925.

2. **Benchmark System and Resource Concerns.** Keeping horses and other large animals creates potential adverse impacts to critical areas.
   a. **Nutrient Pollution of Water.** Animal waste contains nutrients (nitrogen and phosphorous). With each rain, these wastes can wash off the land and into the nearest stream, lake or wetland. In surface water, phosphorous and nitrogen fertilize aquatic plants and weeds. As the plants and weeds proliferate and decay, the dissolved oxygen that fish need to survive is depleted. Nitrogen in the form of...
nitrate is easily dissolved in and carried with rainfall through our permeable soils to ground water. Nitrate concentrations exceeding the maximum contaminate level for safe drinking water are found in many wells of Whatcom County. These can present a significant human health risk, particularly to the very old and young.
b. Pathogen Pollution of Water. Manure contains bacteria and other pathogens. These can make the water unfit for drinking without treatment or shellfish unfit for human consumption. They can also make water unsafe for human contact and recreational sports such as fishing, swimming or water skiing. Both surface and ground water are vulnerable to this type of pollution.
c. Sediment Pollution to Surface Water. Regardless of the amount of supplemental feed provided, large animals will continue grazing until all palatable vegetation is gone. On especially small lots (one or two acres), the animals that are allowed free and continuous access to vegetation quickly graze-out and trample pasture grasses and forbs. These areas are then susceptible to invasion by weeds, including noxious weeds, and brush. The resulting bare ground is subject to erosion from wind and water. Lands that lack adequate vegetation are subject to erosion, and contaminated runoff from these areas can enter water bodies and wetlands and interfere with fish and wildlife habitat.
d. Degradation of Riparian Areas. The term “riparian” is defined in Article 8 of this chapter and includes the areas adjacent to streams, lakes, marine shorelines and other waters. A healthy riparian area is essential to protecting fish and wildlife, including salmon and shellfish. Dense riparian vegetation along the water’s edge will slow and protect against flood flows; secure food and cover for fish, birds and wildlife; and keep water cooler in summer. Uncontrolled grazing removes important riparian vegetation.

3. Standard Farm Conservation Plan Requirements. Owners of low-impact livestock operations have limited options to control animal waste because their operations are small. The required farm conservation plan can be prepared by the landowner and include a simple map of the property, a standard checklist designed to protect water quality, and the following additional components:
a. System Siting and Design. Barns, corrals, paddocks or lots are to be sited to avoid runoff directly into critical areas. Where structures exist and cannot be relocated, corrective measures must be taken to avoid runoff of pollutants and bacteria to critical areas. Where trees and shrubs are absent along a stream, lake, pond or wetland, a strip or area of herbaceous vegetation shall be established and maintained between barns, corrals, paddocks and grazing areas pursuant to the National NRCS Conservation Practice 393, “Filter Strip.” Livestock shall be excluded from the filter strips established to protect critical areas pursuant to NRCS Practice 472, “Livestock Exclusion.” Where trees and shrubs exist along a stream, lake, pond, or wetland, they shall be retained and managed to preserve the existing functions of the buffer pursuant to the NRCS Conservation Practice 391, “Riparian Forest Buffer.”
b. Manure Collection, Storage and Use. Manure and soiled bedding from stalls and paddocks are to be removed and are to be placed in a storage facility protected from rainfall so that runoff does not carry pollutants and bacteria to critical areas. Manure is to be used as cropland fertilizer. The rate of manure application shall not exceed crop requirements. It is to be applied in a manner to avoid runoff of nutrients and bacteria to critical areas.
c. Pasture Management. Pastures are to be established and managed pursuant to “Prescribed Grazing” (NRCS Practice 528A).
d. Exercise or Barn Lots. These normally bare areas must be stabilized and managed to prevent erosion and sediment movement to critical areas. A diversion terrace shall be installed, where necessary, to hinder flow to and across the lot or paddock. Runoff from the lot must be treated via the filter strip or riparian buffer as described in subsection (3)(a) of this section to avoid contaminants reaching critical areas.
e. Existing native vegetation within critical area buffers shall be retained to the extent practicable.
Whatcom County’s Critical Areas Ordinance protects environmentally sensitive natural resources that have been designated for protection and management in accordance with the requirements of the Growth Management Act. Protection and management of these areas is important to the preservation of ecological functions and values of our natural environment, as well as the protection of the public health, safety and welfare of our community.

The sensitive natural resources are defined within four categories: geologically hazardous areas, frequently flooded areas, critical aquifer recharge areas, wetlands, and fish and wildlife habitat conservation areas. Each of these are defined below:

**Geologically Hazardous Areas:**
Geologically hazardous areas are areas that, due to their susceptibility to erosion, sliding, earthquake, or other geological events, may expose development to risks that are inconsistent with the protection of public health and safety. These include landslide hazard areas, seismic hazards, mine hazards, alluvial fans, and erosion hazards areas.

**Frequently Flooded Areas:**
Frequently flooded areas are areas located along major rivers, streams and coastal areas that are inundated by a depth, velocity, intensity and frequency of flood waters during major events that are of such a magnitude that they pose significant, and potentially devastating, risks to human life and property. Development activities proposed within frequently flooded areas must mitigate for flood hazards and conform to the provisions of WCC Title 17 – *Flood Damage Prevention*.

**Critical Aquifer Recharge areas:**
An aquifer is a permeable subsurface soil or rock layer that is capable of storing, transmitting and supplying a significant amount of ground water to wells or springs. Critical aquifer recharge areas are areas that have been identified as having a critical effect on aquifers used for potable water and as being highly susceptible to groundwater contamination. A goal of the CAO is to preserve, protect, and conserve Whatcom County’s groundwater resources for current and future generations by protecting these areas from contamination.

**Wetland areas:**
Wetlands are areas that, under normal circumstances, are inundated or saturated by surface or groundwater frequently enough and long enough to support vegetation that is adapted for life in saturated soil conditions. Wetlands generally include swamps (forested), marshes (non-forested), bogs (peat) and other similar areas, and may be either freshwater or estuarine systems.

**Fish and Wildlife Habitat Conservation areas:**
- ESA Listed Species and Habitat – Listed species are those officially designated by the State Department of Fish and Wildlife and/or the U.S. Fish and Wildlife Service under the Federal Endangered Species Act (ESA) as
endangered, threatened, sensitive, or candidate. Such species include Chinook salmon, bull trout, bald eagle, and California red-legged frog. Listed species are known to be experiencing, or have experienced, failing or declining populations due to factors such as limited numbers, disease, predation, exploitation, or a loss of suitable habitat.

- Habitats and Species of Local Importance – Habitats and species of local importance include habitat that supports both vulnerable and recreationally important species. Vulnerable species, such as the great blue heron, are those susceptible to significant population declines because they are uncommon, have a very limited distribution, or have special space or habitat requirements. Recreationally important species include species with high recreational importance or a high public profile, and that are vulnerable to habitat loss or degradation.

- Shellfish Habitat Conservation Areas – all public and private tidelands that have been identified by the Washington Department of Health as being suitable for commercial shellfish growing areas, as well as any recreational harvest areas identified by the Washington State Department of Ecology. Any area that has been designated as a Shellfish Protection District is also a Shellfish Habitat Conservation Area.

- Kelp and Eelgrass Beds, Pacific Herring Spawning Areas – Eelgrass beds may be found along much of Whatcom County’s marine shorelines, particularly near Point Roberts, Drayton Harbor, Birch Bay, Lummi Bay and around Portage Island. Kelp forests and eelgrass beds provide forage, spawning and refuge areas for a number of marine species, including waterfowl, crab, snails, shrimp, and the Pacific Herring, an important local forage fish. Preservation of kelp and eelgrass beds also serves to protect local beaches from erosion by softening the force of waves against the shoreline.

- Surf Smelt and Sand Lance Spawning Areas – The Whatcom County nearshore environment provides important migratory corridors and habitat for forage fish spawning. Surf smelt and sand lance are schooling plankton feeder fish that are preyed on by a variety of animal species in the marine food web. Both surf smelt and the sand lance spawn along marine shoreline areas, depositing their eggs on protected upper intertidal sand or sandy-gravel beaches. Juvenile fish rear in nearby bays and nearshore areas.

- Rivers and Streams – Rivers and streams are generally characterized by surface water flow that has produced a defined channel or bed. Rivers and streams essentially function as a drainage system that transports water, sediment, and dissolved nutrients across the land’s surface toward the sea. They also provide important habitat elements for fish and wildlife species.
5.2.7 Chapter 90.48 RCW: Water pollution control
(Summarized)

It is declared to be the public policy of the state of Washington to maintain the highest possible standards to insure the purity of all waters of the state consistent with public health and public enjoyment thereof, the propagation and protection of wild life, birds, game, fish and other aquatic life, and the industrial development of the state, and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the state of Washington. Consistent with this policy, the state of Washington will exercise its powers, as fully and as effectively as possible, to retain and secure high quality for all waters of the state. The state of Washington in recognition of the federal government's interest in the quality of the navigable waters of the United States, of which certain portions thereof are within the jurisdictional limits of this state, proclaims a public policy of working cooperatively with the federal government in a joint effort to extinguish the sources of water quality degradation, while at the same time preserving and vigorously exercising state powers to insure that present and future standards of water quality within the state shall be determined by the citizenry, through and by the efforts of state government, of the state of Washington.
5.2.8 Chapter 90.54 RCW: Water resources act of 1971
(Summarized)

Utilization and management of the waters of the state shall be guided by the following general declaration of fundamentals:

(1) The quality of the natural environment shall be protected and, where possible, enhanced as follows:
   (a) Perennial rivers and streams of the state shall be retained with base flows necessary to provide for preservation of wildlife, fish, scenic, aesthetic and other environmental values, and navigational values. Lakes and ponds shall be retained substantially in their natural condition. Withdrawals of water which would conflict therewith shall be authorized only in those situations where it is clear that overriding considerations of the public interest will be served.
   (b) Waters of the state shall be of high quality. Regardless of the quality of the waters of the state, all wastes and other materials and substances proposed for entry into said waters shall be provided with all known, available, and reasonable methods of treatment prior to entry. Notwithstanding that standards of quality established for the waters of the state would not be violated, wastes and other materials and substances shall not be allowed to enter such waters which will reduce the existing quality thereof, except in those situations where it is clear that overriding considerations of the public interest will be served. Technology-based effluent limitations or standards for discharges for municipal water treatment plants located on the Chehalis, Columbia, Cowlitz, Lewis, or Skagit river shall be adjusted to reflect credit for substances removed from the plant intake water if:
      (i) The municipality demonstrates that the intake water is drawn from the same body of water into which the discharge is made; and
      (ii) The municipality demonstrates that no violation of receiving water quality standards or appreciable environmental degradation will result.

(2) Multiple-purpose impoundment structures are to be preferred over single-purpose structures. Due regard shall be given to means and methods for protection of fishery resources in the planning for and construction of water impoundment structures and other artificial obstructions.

(3) Federal, state, and local governments, individuals, corporations, groups and other entities shall be encouraged to carry out practices of conservation as they relate to the use of the waters of the state. In addition to traditional development approaches, improved water use efficiency, conservation, and use of reclaimed water shall be emphasized in the management of the state's water resources and in some cases will be a potential new source of water with which to meet future needs throughout the state. Use of reclaimed water shall be encouraged through state and local planning and programs with incentives for state financial assistance recognizing programs and plans that encourage the use of conservation and reclaimed water use, and state agencies shall continue to review and reduce regulatory barriers and streamline permitting for the use of reclaimed water where appropriate.
The purpose of this chapter is to establish water quality standards for surface waters of the state of Washington consistent with public health and public enjoyment of the waters and the propagation and protection of fish, shellfish, and wildlife:

### Aquatic Life Dissolved Oxygen Criteria in Fresh Water

<table>
<thead>
<tr>
<th>Category</th>
<th>Lowest 1-Day Minimum (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Char Spawning and Rearing</td>
<td>9.5</td>
</tr>
<tr>
<td>Core Summer Salmonid Habitat</td>
<td>8.0</td>
</tr>
<tr>
<td>Salmonid Spawning, Rearing and Migration</td>
<td>8.0</td>
</tr>
<tr>
<td>Salmonid Rearing and Migration Only</td>
<td>6.5</td>
</tr>
<tr>
<td>Non-anadromous Interior Redband Trout</td>
<td>8.0</td>
</tr>
<tr>
<td>Indigenous Warm Water Species</td>
<td>6.5</td>
</tr>
</tbody>
</table>

### Aquatic Life Total Dissolved Gas Criteria in Fresh Water

<table>
<thead>
<tr>
<th>Category</th>
<th>Percent Saturation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Char Spawning and Rearing</td>
<td>Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.</td>
</tr>
<tr>
<td>Core Summer Salmonid Habitat</td>
<td>Same as above.</td>
</tr>
<tr>
<td>Salmonid Spawning, Rearing and Migration</td>
<td>Same as above.</td>
</tr>
<tr>
<td>Salmonid Rearing and Migration Only</td>
<td>Same as above.</td>
</tr>
<tr>
<td>Non-anadromous Interior Redband Trout</td>
<td>Same as above.</td>
</tr>
<tr>
<td>Indigenous Warm Water Species</td>
<td>Same as above.</td>
</tr>
</tbody>
</table>
### Aquatic Life pH Criteria in Fresh Water

<table>
<thead>
<tr>
<th>Category</th>
<th>Percent Saturation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Char Spawning and Rearing</td>
<td>pH shall be within the range of 6.5 to 8.5, with a human-caused variation within the above range less than 0.2 units</td>
</tr>
<tr>
<td>Core Summer Salmonid Habitat</td>
<td>Same as above.</td>
</tr>
<tr>
<td>Salmonid Spawning, Rearing and Migration</td>
<td>pH shall be within the range of 6.5 to 8.5, with a human-caused variation within the above range less than 0.5 units</td>
</tr>
<tr>
<td>Salmonid Rearing and Migration Only</td>
<td>Same as above.</td>
</tr>
<tr>
<td>Non-anadromous Interior Redband Trout</td>
<td>Same as above.</td>
</tr>
<tr>
<td>Indigenous Warm Water Species</td>
<td>Same as above.</td>
</tr>
</tbody>
</table>

### Water Contact Recreation Bacteria Criteria in Fresh Water

<table>
<thead>
<tr>
<th>Category</th>
<th>Percent Saturation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extraordinary Primary Contact Recreation</td>
<td>Fecal coliform organism levels must not exceed a geometric mean value of 50 colonies/100 mL, with not more than 10 percent of all samples (or any single sample with less than ten sample point exist) obtained for calculating the geometric mean values exceeding 100 colonies/100 mL.</td>
</tr>
<tr>
<td>Primary Contact Recreation</td>
<td>Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies/100 mL, with not more than 10 percent of all samples (or any single sample with less than ten sample point exist) obtained for calculating the geometric mean values exceeding 200 colonies/100 mL.</td>
</tr>
<tr>
<td>Secondary Contact Recreation</td>
<td>Fecal coliform organism levels must not exceed a geometric mean value of 200 colonies/100 mL, with not more than 10 percent of all samples (or any single sample with less than ten sample point exist) obtained for calculating the geometric mean values exceeding 400 colonies/100 mL.</td>
</tr>
</tbody>
</table>
*Relative values listed below describe qualities of salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

**Aquatic Life Dissolved Oxygen Criteria in Marine Water**

<table>
<thead>
<tr>
<th>Category</th>
<th>Percent Saturation (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extraordinary Quality</td>
<td>7.0</td>
</tr>
<tr>
<td>Excellent Quality</td>
<td>6.0</td>
</tr>
<tr>
<td>Good Quality</td>
<td>5.0</td>
</tr>
<tr>
<td>Fair Quality</td>
<td>4.0</td>
</tr>
</tbody>
</table>

**Aquatic Life pH Criteria in Marine Water**

<table>
<thead>
<tr>
<th>Category</th>
<th>pH Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extraordinary Quality</td>
<td>pH shall be within the range of 7.0 to 8.5, with a human-caused variation within the above range less than 0.2 units</td>
</tr>
<tr>
<td>Excellent Quality</td>
<td>pH shall be within the range of 7.0 to 8.5, with a human-caused variation within the above range less than 0.5 units</td>
</tr>
<tr>
<td>Good Quality</td>
<td>Same as above.</td>
</tr>
<tr>
<td>Fair Quality</td>
<td>pH shall be within the range of 6.5 to 9.0, with a human-caused variation within the above range less than 0.5 units</td>
</tr>
</tbody>
</table>

**Water Contact Recreation Bacteria Criteria in Fresh Water**

<table>
<thead>
<tr>
<th>Category</th>
<th>Percent Saturation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Contact Recreation</td>
<td>Fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, with not more than 10 percent of all samples (or any single sample with less than ten sample point exist) obtained for calculating the geometric mean values exceeding 43 colonies/100 mL.</td>
</tr>
<tr>
<td>Secondary Contact Recreation</td>
<td>Fecal coliform organism levels must not exceed a geometric mean value of 70 colonies/100 mL, with not more than 10 percent of all samples (or any single sample with less than ten sample point exist) obtained for calculating the geometric mean values exceeding 208 colonies/100 mL.</td>
</tr>
</tbody>
</table>
5.2.10 Chapter 173-216 WAC  
State Waste Discharge Permit Program  
(Summarized)

(1) It shall be the policy of the department in carrying out the requirements of this chapter, to maintain the highest possible standards to ensure the purity of all waters of the state and to require the use of all known, available and reasonable methods to prevent and control the discharge of wastes into the waters of the state. Notwithstanding that standards of quality established for the waters of the state would not be violated, wastes and other materials shall not be allowed to enter such waters which will reduce the existing quality thereof, except in those situations where it is clear that overriding considerations of public interest will be served.

(2) Consistent with this policy, the discharge of waste materials into municipal sewerage systems which would interfere with, pass through, or otherwise be incompatible with such systems or which would contaminate the sludge will not be permitted.

(3) Consistent with this policy, the department will act to prevent the disposal of wastes that present a risk to human health, including the potential, chronic effects of lifetime exposure to waste materials.
Table 1. Hazardous gasses emitted by chickens.

<table>
<thead>
<tr>
<th>Gases</th>
<th>Odor</th>
<th>Threshold limit value (ppm)</th>
<th>Gas concentration (ppm) and physiological response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>Sharp pungent</td>
<td>25</td>
<td>5-50: Least detectable odor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100-500: Irritation to mucous surfaces in 1 hour</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>600-1000: Immediate irritation of eyes, nose and throat</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2000-3000: Severe eye irritation, coughing and frothing at mouth, could be fatal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5000: Respiratory spasm, rapid asphyxia, may be fatal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10000: Rapidly fatal</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>None</td>
<td>5000</td>
<td>20,000: Safe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30,000: Increased breathing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>40,000: Drowsiness, headaches</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>60,000: Heavy asphyxiated breathing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3,000,000: Could be fatal (30 minutes exposure)</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>Offensive rotten egg smell</td>
<td>10</td>
<td>0.01-0.7: Least detectable odor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3-5: Offensive odor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10: Eye irritation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20: Irritation to mucous membrane and lungs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50-100: Irritation to eyes and respiratory tracts (1 hour exposure)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>200: Dizziness (1 hour), nervous system depression</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>500-600: Nausea, excitement, unconsciousness, possible death (30 minutes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>700-2000: Rapidly fatal</td>
</tr>
<tr>
<td>Methane</td>
<td>None</td>
<td>-</td>
<td>5,900,000: Asphyxiant</td>
</tr>
<tr>
<td>Methyl mercaptan</td>
<td>Disagreeable odor like garlic and rotten cabbage</td>
<td>0.04</td>
<td>4: Poison</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Some investigators have reported that the toxicity of methyl mercaptan is similar to hydrogen sulfide</td>
</tr>
</tbody>
</table>
### Bellingham Significant Species

The following preliminary list of species are of local significance in the City of Bellingham and are identified as Bellingham’s Significant Species. This list was derived from combining several references, species lists and comments from the local wildlife experts. It is however potentially incomplete and changeable as better, more complete information becomes available. Without local species occurrence, population and distribution data it is difficult to confirm those species or populations that are in need of special consideration. Locally documented observations or existing reports were lacking or unavailable for the following groups which should be reviewed for inclusion as potential significant species:

- all macro invertebrates, particularly beetles, butterflies, moths and others which appear on federal and state lists of concern or are endemic to Bellingham
- marine fishes and macro invertebrates
- fresh water sculpins which are a species are of concern
- other fresh water fish not identified as part of routine stream surveys

The significant species list contains all federal and state endangered, threatened, candidate, proposed, monitor and state PHS species. This list should be used as a preliminary master guide to those species that are at risk and or are protected under law and require special planning and development considerations.

- **F/e,t,c,p** = Federal/endangered, threatened, proposed, candidate
- **S/e,t,s,c,m** = Washington State/ endangered, threatened, sensitive, candidate, monitor
- **PHS** = Washington Department of Wildlife Priority Species and Habitat
- **LS** = locally significant

#### Fish

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacific Lamprey (<em>Lampetra tridentata</em>)</td>
<td>LS anadromous native/naturally reproducing</td>
</tr>
<tr>
<td>Chum Salmon (<em>Oncorhynchus keta</em>)</td>
<td>LS anadromous native/naturally reproducing</td>
</tr>
<tr>
<td>Coho Salmon (<em>Oncorhynchus kisutch</em>)</td>
<td>LS anadromous native/naturally reproducing</td>
</tr>
<tr>
<td>Kokanee (<em>Oncorhynchus nerka</em>)</td>
<td>PHS/LS resident/native/naturally reproducing</td>
</tr>
<tr>
<td>Chinook Salmon (<em>Oncorhynchus tshawytscha</em>)</td>
<td>LS anadromous/native</td>
</tr>
<tr>
<td>Searun Cutthroat Trout (<em>Salmo clarki</em>)</td>
<td>PHS/LS anadromous/native/naturally reproducing</td>
</tr>
<tr>
<td>Rainbow Trout (<em>Salmo gairdneri</em>)</td>
<td>PHS/LS resident form/native/naturally reproducing</td>
</tr>
<tr>
<td>Steelhead (<em>Salmo gairdneri</em>)</td>
<td>PHS/LS anadromous/native/naturally reproducing</td>
</tr>
<tr>
<td>Dolly Varden (<em>Salvelinus malma</em>)</td>
<td>PHS/LS anadromous/native</td>
</tr>
<tr>
<td>Sculpin (<em>Cottus spp.</em>)</td>
<td>Sc/LS (for five species not yet identified in Bellingham)</td>
</tr>
</tbody>
</table>

#### Amphibians

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwestern Salamander (<em>Ambystoma gracile</em>)</td>
<td>LS* vulnerable to habitat disturbance/region declines/limited mobility</td>
</tr>
<tr>
<td>Long Toed Salamander (<em>Ambystoma macrodactylum</em>)</td>
<td>LS* same as above</td>
</tr>
<tr>
<td>Ensatina (<em>Ensatina eschscholtzi</em>)</td>
<td>LS* same as above</td>
</tr>
</tbody>
</table>

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69A
Western red-backed salamander (*Plethodon vehiculum*)  LS* same as above
Western Toad (*Bufo boreas*)  LS* decline in local population
Tailed Frog (*Ascaphus truei*)  Sc/LS
Red Legged Frog (*Rana Aurora*)  Fc/LS

**Reptiles**

Rubber Boa (*Charina bottae*)  LS* rare

**Birds**

Common Loon (*Gavia immer*)  Sc/PHS/LS
Horned Grebe (*Podiceps auritus*)  Sc/PHS
Western Grebe (*Aechmophorus occidentalis*)  Sc/LS significant winter density on the bay
Brandt’s Cormorant (*Phalacrocorax penicillatus*)  Sc/PHS
Great Blue Heron (*Ardea herodias*)  Sc/PHS/LS
Green Backed Heron (*Butorides striatus*)  Sc/PHS/LS
Trumpeter Swan (*Cygnus buccinator*)  PHS
Cavity Nesting Ducks  PHS/LS
  - Wood duck (*Aix sponsa*)
  - Hooded merganser (*Lophodytes cucullatus*)
  - Bufflehead (*Bucephala albeola*)
Harlequin Duck (*Histrionicus histrionicus*)  Fc/PHS/LS
Turkey Vulture (*Cathartes aura*)  Sc/PHS
Osprey (*Pandion haliaetus*)  Sc/PHS/LS
Bald Eagle (*Haliaeetus leucocephalus*)  Ft/St/PHS/LS
Northern Goshawk (*Accipiter gentilis*)  Fc/Sc/PHS
Red Tailed Hawk (*Buteo jamaicensis*)  PHS/LS
Merlin (*Falco columbarius*)  Sc/PHS/LS
Peregrine Falcon (*Falco peregrinus*)  Fe/Se/PHS/LS
Virginia rail (*Rallus limicola*)  LS* wetland associated, very secretive, lack data
Sora (*Porzana carolina*)  LS* wetland associated, very secretive, lack data
Snipe (*Gallinago gallinago*)  LS* wetland associated, secretive, lack data
Caspian Tern (*Sterna caspia*)  Sc/PHS
Marbled Murrelet (*Brachyramphus marmoratus*)  Ft/Sc/PHS/LS marine/old growth dependent, feeds near shore, susceptible to oilspills, gillnet entanglement & habitat loss.
Band-Tailed Pigeon (*Columbia fasciata*)  PHS/LS
Great Horned Owl (*Bubo virginianus*)  LS*
Snowy Owl (*Nyctea scandiaca*)  Sc/PHS
Barred Owl (*Strix varia*)  Sc/PHS
Northern saw-whet owl (*Aegolius acadicus*)  LS*
Vaux’s Swift (*Chaetura vauxi*)  Sc/PHS snag dependent, has adapted to man-
City of Bellingham
WILDLIFE AND HABITAT ASSESSMENT

Existing Information

Vaux's Swift (Chaetura vauxi)
Vaux's Swift (Chaetura vauxi)
Sc/PHS snag dependent, has adapted to man-made chimneys
Pileated Woodpecker (Dryocopus pileatus)
Pileated Woodpecker (Dryocopus pileatus)
Sc/PHS/LS, snag depondant, primary cavity excavator
Northern Flicker (Colaptes auratus)
Northern Flicker (Colaptes auratus)
LS* primary cavity excavator, possible decreasing local population
Purple Martin (Progne subis)
Purple Martin (Progne subis)
Sc/PHS/ locally rare due to lost habitat
Brown Creeper (Certhia americana)
Brown Creeper (Certhia americana)
LS* forest interior indicator
American Dipper (Cinclus mexicanus)
American Dipper (Cinclus mexicanus)
LS* stream dependent/indicator of stream and riparian habitat quality
Rufous-sided Towhee (Pipilo erythrophthalmus)
Rufous-sided Towhee (Pipilo erythrophthalmus)
LS* ground nester/vulnerable to urbanization
Ruffled Grouse (Bonasa umbellus)
Ruffled Grouse (Bonasa umbellus)
LS* ground nester/vulnerable to urbanization

Mammals

Townsend's big-eared bat (Plecotus Townsendii)
Townsend's big-eared bat (Plecotus Townsendii)
Fc/Sc/PHS/LS
Long-eared Myotis (Myotis evotis)
Long-eared Myotis (Myotis evotis)
Sc/LS
Long-legged Myotis (Myotis volans)
Long-legged Myotis (Myotis volans)
Sc/LS
Columbian black-tailed deer (Odocoileus hemionus columbianus)
Columbian black-tailed deer (Odocoileus hemionus columbianus)
PHS/LS
Northern Flying Squirrel (Glaucomys sabrinus)
Northern Flying Squirrel (Glaucomys sabrinus)
LS* forest interior indicator/cavity dependent
Mountain Beaver (Aplodontia rufa)
Mountain Beaver (Aplodontia rufa)
LS* local population decline
Porcupine (Erethizon dorsatum)
Porcupine (Erethizon dorsatum)
LS* limited vagility/large home range requirement
Long-tailed Weasel (Mustela frenata)
Long-tailed Weasel (Mustela frenata)
LS* riparian associated
Muskrat (Ondatra zibethicus)
Muskrat (Ondatra zibethicus)
LS* stream/riparian/wetland dependent
Beaver (Castor canadensis)
Beaver (Castor canadensis)
LS* stream/wetland dependent, requires forested riparian habitat
Harbor Seal (Phoca vitulina)
Harbor Seal (Phoca vitulina)
Sc/PHS/LS
River Otter (Lutra canadensis)
River Otter (Lutra canadensis)
LS* shoreline dependent

-Other locally significant populations are:
  - Shorebird concentrations, various species - seasonal PHS/LS*
  - Waterfowl concentrations, various species - seasonal PHS/LS*

* denotes native species of local significance based on life history, habitat requirements and the local population vulnerability to habitat alteration or removal

71A

63
Table 3: A comprehensive list of fish species occurring in Bellingham's lakes and streams.

<table>
<thead>
<tr>
<th>Fish Species Occurring In Bellingham's Lakes and Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order Petromyzontiformes:</td>
</tr>
<tr>
<td>Pacific Lamprey (<em>Lampetra tridentata</em>)</td>
</tr>
<tr>
<td>anadromous</td>
</tr>
<tr>
<td>- native/naturally reproducing</td>
</tr>
<tr>
<td>Order Salmoniformes:</td>
</tr>
<tr>
<td>Chum Salmon (<em>Oncorhynchus keta</em>)</td>
</tr>
<tr>
<td>anadromous</td>
</tr>
<tr>
<td>- native/naturally reproducing (Chuckanut, Padden and Squalicum Crs.),</td>
</tr>
<tr>
<td>- hatchery stocks (Chuckanut, Padden, Squalicum and Whatcom Crs.)</td>
</tr>
<tr>
<td>Coho Salmon (<em>Oncorhynchus kisutch</em>)</td>
</tr>
<tr>
<td>anadromous</td>
</tr>
<tr>
<td>- native/naturally reproducing (Chuckanut, Padden and Squalicum Crs.),</td>
</tr>
<tr>
<td>- hatchery stocks (Chuckanut, Padden, Squalicum and Whatcom Crs.)</td>
</tr>
<tr>
<td>Kokanee or (landlocked) Sockeye (<em>Oncorhynchus nerka</em>)</td>
</tr>
<tr>
<td>resident</td>
</tr>
<tr>
<td>- native/naturally reproducing (Lk. Whatcom)</td>
</tr>
<tr>
<td>- hatchery stock derived from native resident (Lk. Whatcom) stock</td>
</tr>
<tr>
<td>/ naturally reproducing and hatchery plants</td>
</tr>
<tr>
<td>Chinook Salmon (<em>Oncorhynchus tshawytscha</em>)</td>
</tr>
<tr>
<td>anadromous</td>
</tr>
<tr>
<td>- native/hatchery stocks (Whatcom Cr.) fall run only</td>
</tr>
<tr>
<td>White Fish (<em>Prosopium sps.</em>)</td>
</tr>
<tr>
<td>resident</td>
</tr>
<tr>
<td>- native/naturally reproducing</td>
</tr>
<tr>
<td>Cutthroat Trout (<em>Salmo clarki</em>)</td>
</tr>
<tr>
<td>resident form</td>
</tr>
<tr>
<td>- native/naturally reproducing</td>
</tr>
<tr>
<td>- hatchery stock derived from native resident (Lk. Whatcom) stock</td>
</tr>
<tr>
<td>/ naturally reproducing and hatchery plants</td>
</tr>
<tr>
<td>anadromous form (Searun Cutthroat)</td>
</tr>
<tr>
<td>- native/naturally reproducing only</td>
</tr>
<tr>
<td>Rainbow Trout (<em>Salmo gairdneri</em>)</td>
</tr>
<tr>
<td>resident form</td>
</tr>
<tr>
<td>- native/naturally reproducing</td>
</tr>
<tr>
<td>- non-native/naturally reproducing and hatchery plants</td>
</tr>
</tbody>
</table>
anadromous form (Steelhead)
  - native/naturally reproducing
  - non-native/naturally reproducing and hatchery plants
    (locally winter run only)

**Dolly Varden or Bull Trout (Salvelinus malma)**
  anadromous
  - native (native to Nooksack, occur occasionally in Whatcom Cr. to feed)

**Order Cypriniformes:**

**Goldfish (Carassius auratus)**
  resident
  - non-native (naturally reproducing in Toad Lake)

**Order Siluriformes:**

**Brown Bullhead or Catfish (Ictalurus catus)**
  resident
  - non-native/naturally reproducing from past hatchery plants

**Order Gasterosteiformes:**

**Three Spine Stickelback (Gasterosteus aculeatus)**
  resident
  - native/naturally reproducing

**Order Perciformes:**

Family Centrachidae:

**Largemouth Bass (Micropterus salmoides)**
  resident
  - non-native/naturally reproducing from past hatchery plants

**Smallmouth Bass (Micropterus dolomieu)**
  resident
  - non-native/naturally reproducing from past hatchery plants

**Crappie (Pomoxis annularis)**
  resident
  - non-native/naturally reproducing from past hatchery plants
Family Percidae:

**Yellow Perch** (*Perca flavescens*)
- non-native/naturally reproducing from past hatchery plants

Family Cottidae:

**Sculpin** (*sp*)
- native/naturally reproducing
5.4 REFERENCES


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