CRITICAL AREAS REGULATIONS AND SCIENCE

Course Instructor,
Steven Neugebauer, LHG, LEG, PG, REA

WELCOME!

- March 19, 2011 **CAPR Workshop and Banquet**
- Course Schedule:

Time	Speaker	Topic
9:30 AM to 9:45 AM	Rick Forschler	Welcome, Agenda, & Info
9:45 AM to 11:15 AM	Steve Neugebauer	Critical Areas
15 Minute Break		
11:30 AM to 12:45 PM	Steve Neugebauer	(Lunch Plus Presentation) Critical Areas (Continued)
15 Minute Break		
1:00 PM to 2:15 PM	Paul Hirsch	Takings and Eminent Domain
15 Minute Break		
2:30 PM to 3:45 PM	Justin Park	Appeals and Federal statutory means of challenging wetland and other sensitive areas determinations.

A Lot to Cover…

- This course is normally provided as a 16-hour, four part course. We are compressing this into about 6 hours.
- Due to time constraints, this course focuses primarily on **Wetland** and **Fish and Wildlife Habitat Conservation Areas - Critical Areas** because these generally impact more property than any other critical areas.
- Questions can be asked at any time during the course presentation.
- The course materials are designed to allow for a 15 to 20-minute question period. If more time is spent on questions, some course materials may not be covered.

Course Overview

- **Critical Areas and Similar Regulations**
  - Administered by municipalities, typically planners
  - **Regulatory History**
    - **Federal, State, and Local Regulations**
      - Clean Water Act of 1977 (as amended)
      - Endangered Species Act of 1973 (as amended)
      - Safe Drinking Water Act of 1974 (as amended)
    - **The Growth Management Act of 1990** (as amended)
    - **Shoreline Management Act of 1972** (as amended)
- **Effects of the Critical Areas Ordinances on Development, with emphasis on "ecological" critical areas**
- **The different types of Critical Areas** will be discussed, with an emphasis on ecological critical areas, because these most commonly impact development.

Course Overview (Cont.)

- **Critical Areas - Science and Case Studies**
- **What is Best Available Science (BAS) Why** this needs to be addressed (and **How,** HB 1307 and SB 5644 (new BAS bills) will benefit those who are affected by critical areas if these bills are passed by State Legislature)
- **What are the Basic Requirements of Each Regulation?**
- **What is the Difference Between Laws and Regulations?**
  - **Why do attorney's teach the second part of this course?**
  - **Why is Case Law important?**
  - **Why is legal interpretation of the laws important? • Who makes the laws? • Is it better to fight in court or get the laws changed?**
- **Why are Regulations Important to Scientists and Why is Basic Knowledge of the Laws Important?**

Parts 2 and 3 of this Course

- **Paul Hirsch, PhD, JD**
  – Takings and Eminent Domain.

- **Justin Park , JD**
  – Appeals and Federal statutory means of challenging wetland and other sensitive areas determinations.

Laws and Regulations Leading to the Critical Areas Ordinances

- **Federal Water Pollution Control Act,** commonly referred to as the **Clean Water Act (CWA) of 1977** (as amended in 1987). Why is this particular amendment important?
  - As of 1987, the FWPCA began regulating point source storm water. This included revisions to Section 402 of the CWA, which implemented permit requirements for point source storm water, including permits for municipal separate storm sewer systems (MS4 – which is an acronym of the "M" in municipal, and "S4" for the next four words that begin with the letter "S")
- **The Federal Water Pollution Control Act Amendments of 1972**, PL 92-500, replaced the previous language of the Act entirely, including: the Water Quality Act of 1965, the Clean Water Restoration Act of 1966, and the Water Quality Improvement Act of 1970, all of which had been amendments of the Federal Water Pollution Control Act first passed in 1956. The 1977 amendments, PL 95-217, further amended PL 92-500.

Clean Water Act

- **The 1987 Amendments** included requirements for storm water permit requirements.
- **Section 402** is the section that requires permits for discharges to "receiving waters" for those who treat waste water; and for storm water discharges (including municipal storm water discharges) – the storm water provision was added in 1987.
- **Section 401** regulates water quality, and can require some systems to obtain certifications to allow them to discharge to receiving waters. Especially if storm water is discharged to wetland areas.
- **Section 404** regulates water quality associated with filling and dredging, including wetland areas.
- **USEPA is the Administrator for CWA** – The USACE has been delegated to administer Section 404 under USEPA oversight.
- **CWA applies to "Navigable" waters of the United States,** and the tributaries to these "Navigable" waters. This is no called **"Waters of the United States"** and has been further complicated by the "significant nexus" rule from Rapanos. Also, "Waters of the United States" are referred to in the Section 402 permit as **"receiving waters",** the "permitted" waters discharged to the receiving waters are called **"point source" waters.** Point source waters are considered to be polluted until they are treated, or released to the receiving waters, including storm water.

Clean Water Act (Cont.)

- The Rapanos decision (US Supreme Court, June 19, 2006) implies that a "significant nexus" must exist to allow a wetland (or a stream) to be regulated by the CWA (Justice Kennedy). This falls into the legal area for attorneys, but wetland scientists must know what a significant nexus is to allow them to determine if the wetland is **jurisdictional** (by federal laws).
- Regulates water quality, storm water discharges, waste water discharges, and wetland areas for ALL water types that are "Wasters of the United States" or that form a significant nexus with "Waters of the United States".
- There is MUCH more to this Act than wetlands or Section 402, especially when it comes to the regulations which are in Title 40 of the Code of Federal Regulations (CFR) Chapter I, Subchapter D, Parts 100 – 135.
- The CWA is expansive and every regulation in Title 40 includes provisions for Citizen's Lawsuits, and non-compliance with the requirements in this Title can be as much as $37,500 per day, per violation.

Potential Fines from Title 40 CFR § 19

§ 19.4 Penalty adjustment and table.

The adjusted statutory penalty provisions and their applicable amounts are set out in Table 1. The last column in the table provides the newly effective statutory civil penalty amounts.

Table 1 of Section 19.4—Civil Monetary Penalty Inflation Adjustments

U.S. code citation	Environmental statute	Statutorypenalties, as enacted	Penaltieseffective after January 30, 1997 through March 15, 2004	Penaltieseffective after March 15, 2004 through January 12, 2009	Penaltieseffective after January 12, 2009
33 U.S.C. 1319(d)	CLEAN WATER ACT (CWA)	25,000	27,500	32,500	37,500
33 U.S.C. 1319(g)(2)(A)	CWA	10,000/25,000	11,000/27,500	11,000/32,500	16,000/37,500
33 U.S.C. 1319(g)(2)(B)	CWA	10,000/125,000	11,000/137,500	11,000/157,500	16,000/177,500
33 U.S.C. 1321(b)(6)(B)(i)	CWA	10,000/25,000	11,000 /27,500	11,000/32,500	16,000/37,500
33 U.S.C. 1321(b)(6)(B)(ii)	CWA	10,000/125,000	11,000/137,500	11,000/157,500	16,000/177,500
33 U.S.C. 1321(b)(7)(A)	CWA	25,000/1,000	27,500/1,100	32,500/1,100	37,500/1,100
33 U.S.C. 1321(b)(7)(B)	CWA	25,000	27,500	32,500	37,500
33 U.S.C. 1321(b)(7)(C)	CWA	25,000	27,500	32,500	37,500
33 U.S.C. 1321(b)(7)(D)	CWA	100,000/3,000	110,000/3,300	130,000/4,300	140,000/4,300

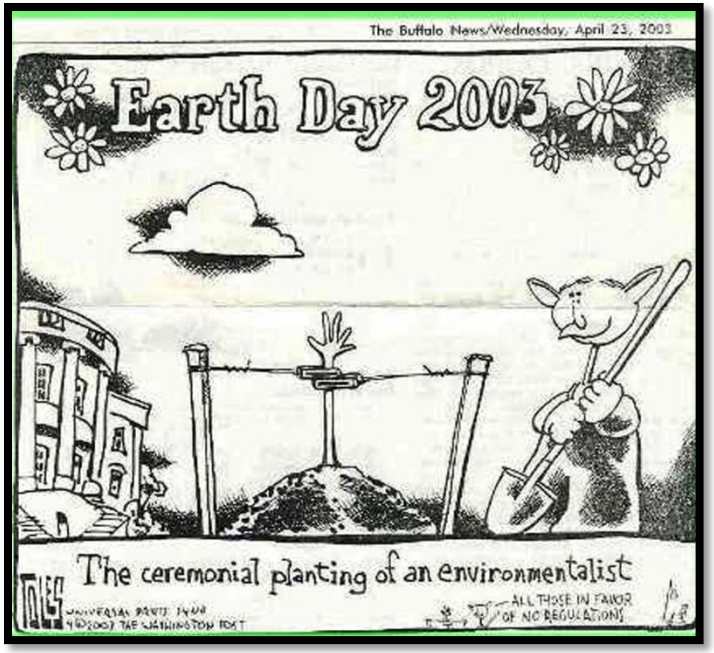
Endangered Species Act of 1973 (as amended)

- Established requirements for lists of Threatened and Endangered Species (TES).
- Designates critical habitats for TES.
- Administered by the U.S. Fish and Wildlife Service (USFWS).
- Is one of the laws used to regulate water bodies, including water bodies not regulated by the CWA.
- Regulates any critical habitat where TES are present.
- In Washington State, the Washington State Department of Fish and Wildlife (WDFW) administer state programs and act as a liaison with the USFWS, the National Oceanic and Atmospheric Administration (NOAA) and the National Marine Fisheries Service – (NMFS).

Separate Views of the TES and CWA

- The TES the CWA and similar laws have led to significant conflicts between "environmentalists" and property owners.
- These laws place restrictions on privately-owned land and has arguably infringed on property owners' constitutional rights.

Differing views for these regulations…



Safe Drinking Water Act of 1974

- The SDWA requires the EPA to establish *National Primary Drinking Water Regulations* (NPDWRs) for contaminants that may cause adverse public health effects.
- The regulations include both mandatory levels (Maximum Contaminant Levels – MCLs) and health goals (Maximum Contaminant Level Goals – MCLGs) for each included contaminant.
- SDWA authorized the EPA to regulate injection of contaminants to ground water, including injection wells, in order to protect underground sources of drinking water.
- Requires a Underground Injection Control permit when polluted water is discharged to ground water, **this can include many urban lakes in the Puget Lowlands** (kettle lakes).
- Direct storm water discharges to kettle lakes and ponds can require a UIC permit and pre-treatment. **To SNR's knowledge, NO municipality has obtained this permit.**

What is wrong with this picture?

- Kettle Lake
  - Primary hydrology is that of ground water.
- Direct storm water discharges (at least 10) to kettle lake (approx. 110-acre feet in a 20-acre lake).

State Environmental Policy Act (SEPA), 1971, Chapter 43.21C RCW

- Derived from the National Environmental Policy Act (NEPA), 1969
- Like NEPA, the original intent was to evaluate environmental impacts from government projects, and it evolved to include non-governmental projects.
- Begins with a SEPA environmental checklist. Evolves to Environmental Assessments (EA) and Environmental Impact Statements (EIS).
- Applies to proposed actions (including changes in Comprehensive Plans), rezoning, and other actions including subdivisions and other proposed development activities.

Shoreline Management Act (SMA) 1971, Chapter 90.58 RCW

- Establishes "shorelines of state-wide significance, and shorelines of the State".
- Includes,
  - All marine waters;
  - Streams with greater than 20 cubic feet per second, mean annual flow;
  - Water bodies 20 acres or larger (lakes);
  - Upland areas called "shorelands" that extend 200 feet landward from the edge of these waters; and
  - The following areas when they are *associated* with one of the above:
    - biological wetlands and river deltas; and
    - some or all of the 100-year floodplain, including all wetlands within the 100-year floodplain.
- Shorelines of the State are not regulated by the Growth Management Act, however, ponds (less than 20 acres in size) are regulated by the Growth Management Act, primarily under "Fish and Wildlife Conservation Areas".

SMA (Cont.)

- Some definitions from the SMA are used in Critical Areas ordinances.
- The SMA was changed last year (2010) due to a State Supreme Court Decision, Futurewise v the Growth Management Hearings Board, which was based on changes the legislature made to the GMA and SMA in 2002, stating that the shorelines will only be regulated by the SMA, and everything else is regulated by the GMA (critical areas). The Supreme Court found that the shorelines are only regulated by the SMA, but left one important question - When was this effective?
- This led the legislature to propose EHB 1653, which was eventually adopted, changing the SMA in 2010.
- The SMA is still different from the GMA Critical Areas, but requires that municipalities adopt SMPs (Shoreline Master Programs) that address the same types of "hazards and ecological areas" that the GMA requires under the Critical Areas ordinance, and that these be addressed at least as stringently as they are under a municipality's Critical Areas ordinance. However, there are differences, such as the SMA's, "no net loss in 'existing' habitat functions," which is very different from the GMA's requirements, which can be much more stringent and require expensive restoration activities to enhance habitat functions that may not have existed in the past.

SMA (Cont.)

- Requires Counties and municipalities to develop Shoreline Master Programs.
- Many Counties have adopted the stream typing in this Code; however, many (such as King County) have included lakes in this typing, which was developed for fluvial (stream) systems.
- Some Counties and Cities have included shorelines in their Critical Areas Ordinances, effectively regulating shorelines under two different ordinances.
- Even after the retroactive change (to 2002) in the SMA, many municipalities, including King County, continue to regulate shorelines with Critical Areas Ordinances, including those that do not exist in the GMA (aquatic areas).
- No State or Federal law includes a definition for a stream (rivers are large streams), including WAC 222.16.030 which is what is required by the GMA to type streams (Rivers are just big streams, but are considered shorelines, streams are not, just as lakes (20 acres in size or larger are shorelines and ponds are not, both are lacustrine systems, the only difference is size – although there are many different types of lakes in the Puget Lowlands).

Forest Practices Act (1974), Chapter 76.09 RCW

- Includes WAC 222.16 which the Growth Management Act accepts as fundamental Best Available Science (BAS) for typing streams, but not for determining if a water body is a stream.
- Provides no definition for a stream or waterway (the WDFW regulations include a definition for a waterway, but not a stream).
- Assumes all channelized water bodies are streams (therefore does not meet BAS requirements for identifying streams).
- Does not consider fluvial geomorphology.

Fish and Wildlife Code of the State of Washington, 1980, RCW 77

- Administered by the Washington State Department of Fish and Wildlife.
- Includes staff that are law enforcement officers.
- Primarily established to protect fish and wildlife, however, fish protection crosses over to include potential permitting for development activities and any work on "waters of the state".
- The WDFW Issues Hydraulic Project Approval permits and JARPAs (Joint Aquatic Resource Permit Applications).
- A JARPA permit is required for any construction activity that will use, divert, obstruct, or change the bed or flow of state waters. Permittee must follow the terms of a permit.
- The department may not require that the provisions of the State Environmental Policy Act (SEPA), chapter 43.21C RCW, are to be met as a condition of issuing a permit under this subsection.
- Protection of aquatic life is the only ground upon which approval of a permit may be denied or conditioned. Approval of a permit may not be unreasonably withheld or unreasonably conditioned. Except as provided in this subsection and subsections (8), (10), and (12) of this section, the department has forty-five calendar days upon receipt of a complete application to grant or deny approval of a permit.

Growth Management Act, 1990, RCW 36.70A

- Enacted to reduce “urban sprawl”.
- Requires Comprehensive Plans and Critical Areas Ordinances. Requires updates for both.
- Not required for all municipalities.
- Establishes what are considered to be Critical Areas.
- Requires Best Available Science to be used when adopting a Critical Areas Ordinance.
- Establishes property rights and twelve other goals.
- Established the Growth Management Hearings Board.

Growth Management Act (Cont'd.)

- Why does this Act and the King County Sensitive Areas Ordinance coincide with the change in the CWA in 1987 (Water Quality Act of 1987), which requires certain municipalities to obtain Municipal Storm Water NPDES permits for their municipal separate storm sewer systems – MS4s?
- King County and other highly-populated counties in Washington State received the first Phase I Municipal Storm Water NPDES permit in 1995. Other municipalities received their Phase II municipal storm water NPDES permits in January 2007. These regulate point source discharges to "receiving waters" and require all permittees to follow the requirements (at a minimum) of the Storm Water Management Manual for Western (or Eastern) Washington, Ecology, 2005 when designing and maintaining MS4 systems. Most municipalities define their storm water systems as a combination of natural and manmade features that handle "permitted" storm water.
- Washington Code Chapter 173-220 WAC - National pollutant discharge elimination system permit program, which also regulates **nonpoint source water**.
- It is much less expensive to construct, maintain, and handle storm water infrastructure in concentrated areas such as high-density urban areas than lighter-density suburban and rural areas (this also applies to all infrastructure).
- It can be very expensive to obtain easements and land for a MS4 system, however, streams and wetland areas do not require this, nor do flooding events from these "natural features" result in potential liabilities. This makes it convenient to reclassify all channelized water bodies as "streams" and all stored storm water as wetland areas (including farm ponds, even though the GMA and SMA specifically exempt drainage ditches and storm water detention facilities from being classified as wetland areas).

Watershed Planning, 1998, Chapter 90.82 RCW

- Provides a process to allow citizens in a watershed to join together to assess the status of the water resources in their watershed and determine how best to manage them. The plans must balance competing resource demands. They are required to address water quantity by undertaking an assessment of water supply and use within the watershed. This includes recommending long-term strategies to provide water in sufficient quantities to satisfy minimum instream flows, and to provide water for future out-of-stream needs. Optional elements that may be addressed in the plan include instream flow, water quality, and habitat.
- This does not address the hydrologic balance of the area, nor is BAS required. This can lead to lakes being used as storm water detention facilities, resulting in shoreline erosion and localized flooding, and it can begin the eutrophication process in oligotrophic lakes and ponds.

Critical Areas vs. Sensitive Areas Ordinances

- GMA (RCW 36.70A.060) requires Counties and Municipalities to adopt Critical Areas regulations.
- The GMA was amended in 1995 to require counties and cities to include the best available science in developing their policies and development regulations to protect the functions and values of critical areas (RCW 36.70A.172).
- All jurisdictions (that are required to implement the GMA programs) are required to review, evaluate, and, if necessary, revise their Critical Areas ordinances according to an update schedule adopted in 2002.
- King County adopted a Sensitive Areas ordinance at the same time the State was in the process of adopting the GMA and including critical areas – Is this a coincidence? Why did the State and a County adopt regulations that are similar to, or exactly the same as, existing federal regulations (and other State regulations)? Ask the attorneys… but these do coincide with the changes made to the CWA in 1987.
- Some cities choose not to use "Critical Areas Ordinance" because of a mandate made by King County called the CAO – that would take 2/3 of rural land from property owner control. The City of Duvall calls their ordinance their "Sensitive Areas Ordinance" specifically for this reason. However, in a State Supreme Court decision called "CAPR v. Ron Simms", the County's Critical Areas Ordinance that removed rural landowners' rights was overturned.

Critical Areas vs. Sensitive Areas Ordinances (Cont.)

- There are several reasons for the Sensitive Areas Ordinances:
  - Enacted prior to 1990, when the Growth Management Act (GMA) was promulgated.
  - Nomenclature issues with the term, CAO.
    - King County CAO changed in 2004 to restrict development and clearing of farm land using GMA as a basis.
    - Appeals court overturned in July 2008 by Supreme Court in CAPR v Ron Simms.
    - King County appealed to State Supreme Court and was not heard (similar to Futurewise v. the Growth Management Hearings Board).
    - Some King County Municipalities adopted the Sensitive Areas Ordinance to avoid confusion with the changes in the King County CAO.

Critical Areas vs. Sensitive Areas Ordinances (Cont'd.)

- Which nomenclature is in use?
  - Both – Although the GMA uses the term Critical Areas, many municipalities and some counties use the term, Sensitive Areas Ordinance.
  - Some municipalities, such as King County, "invented" critical areas that were not in the GMA and called them, "aquatic areas". They designed this to regulate shorelines under the GMA instead of the SMA, so the County could avoid having to revise their SMP.
  - Aquatics Areas is vulnerable under the new SMA, but this will require legal action and falls under the legal system where the attorneys need to evaluate this issue. It is being challenged in a case associated with a kettle lake in Renton for several reasons, but one reason is that the lake is being used as the County's regional storm water detention facility, per the County's own documents. Under the GMA and SMA, wetland areas cannot be identified in storm water detention facilities; this status is DIFFERENT from reservoirs, which may also affect the shoreline status, but (to SNR's knowledge) this has not (yet) been addressed in the legal system.

Types of Critical Areas

- **The GMA defines several Critical Areas: Ecological, Environmental, Geologic Hazards, and State Natural Area Preserves and Natural Resource Conservation Areas.**
  - Ecological Critical Areas
    - Wetland Areas
    - Fish and Wildlife Conservation Areas
    - Waters of the State
  - Environmental Critical Areas
    - Aquifer Recharge Areas
    - Wellhead Protection Areas
    - Frequently Flooded Areas

Types of Critical Areas (Cont'd.)

- Geologic Hazards
  - Erosion hazard
  - Landslide hazard
  - Seismic hazard
  - Volcanic hazard
  - Mine hazards

GMA Critical Areas that Overlap Federal Laws and Regulations

- Wetland Areas
- Fish and Wildlife Conservation Areas
- Waters of the State
- Aquifer Recharge Areas
- Wellhead Protection Areas
- Frequently Flooded Areas

GMA Goals

- The following are the Legislature's goals for promulgating the GMA (as stated in the GMA, however, there may be other reasons):
  - **Urban Growth**. Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner.
  - **Reduce Sprawl**. Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development.
  - **Transportation**. Encourage efficient multimodal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans.

GMA Goals (Cont.)

- **Housing**. Encourage the availability of affordable housing to all economic segments of the population of the State, promote a variety of residential densities and housing types, and encourage preservation of existing housing stock.
- **Economic Development**. Encourage economic development throughout the State that is consistent with adopted comprehensive plans, promote economic opportunity for all citizens of this State, especially for unemployed and for disadvantaged persons, promote the retention and expansion of existing businesses and recruitment of new businesses, recognize regional differences impacting economic development opportunities, and encourage growth in areas experiencing insufficient economic growth, all within the capacities of the State's natural resources, public services, and public facilities.
- **Property Rights**. Private property shall not be taken for public use without just compensation having been made. The property rights of landowners shall be protected from arbitrary and discriminatory actions.

GMA Goals (Cont.)

- **Permits.** Applications for both State and local government permits should be processed in a timely and fair manner to ensure predictability.
- **Natural Resource Industries.** Maintain and enhance natural resource-based industries including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forest lands and productive agricultural lands, and discourage incompatible uses.
- **Open Space and Recreation.** Retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks and recreation facilities.
- **Environment.** Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.

GMA Goals (Cont.)

- **Citizen Participation and Coordination.** Encourage the involvement of citizens in the planning process and ensure coordination between communities and jurisdictions to reconcile conflicts.
- **Public Facilities and Services.** Ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards.
- **Historic Preservation.** Identify and encourage the preservation of lands, sites, and structures that have historical or archaeological significance.

1995 GMA Amendment

- The Amendment was intended to ensure that cities and counties consider reliable scientific information when adopting Critical Areas policies and regulations to protect the functions and values of critical areas (RCW 36.70A.172).
- Under the same statute, counties and cities are required to give special consideration to conservation or protection measures necessary to preserve or enhance anadromous fisheries, including salmon, steelhead, and bull trout fisheries. In addition, the National Marine Fisheries Service (NMFS) has listed 16 populations of Washington salmon and bull trout populations as "endangered" or "threatened" under the Endangered Species Act. A variety of mechanisms including erosion and storm water controls, and setbacks or buffers around streams, wetlands and shorelines are believed to protect anadromous fish habitat from activities that contribute to erosion, surface water runoff, and pollution.

Provisions in the GMA and other State Ordinances to Protect Property Owners.

- RCW 36.70A.370 Protection of Private Property
- The State Attorney General shall establish an orderly, consistent process, including a checklist, if appropriate, that better enables State agencies and local governments to evaluate proposed regulatory or administrative actions to assure that such actions do not result in an unconstitutional taking of private property.
- Local governments that are required or choose to plan under RCW 36.70A.040 and state agencies shall utilize the process established by subsection (1) of this section to assure that proposed regulatory or administrative actions do not result in an unconstitutional taking of private property.

Provisions in the GMA (Cont.)

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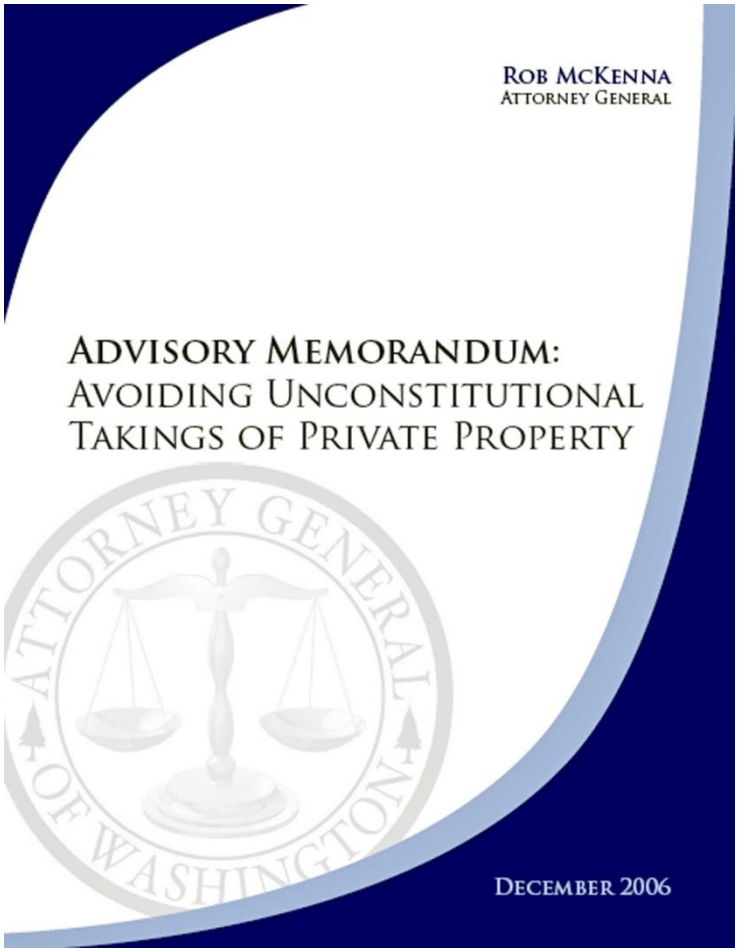


Provisions in the GMA and other State Ordinances to Protect Property Owners. (Cont.)

- RCW 64.40.020 - Applicant for permit – Actions for damages from governmental actions
  - Owners of a property interest who have filed an application for a permit have an action for damages to obtain relief from acts of an agency which are arbitrary, capricious, unlawful, or exceed lawful authority, or relief from a failure to act within time limits established by law: PROVIDED, That the action is unlawful or in excess of lawful authority only if the final decision of the agency was made with knowledge of its unlawfulness or that it was in excess of lawful authority, or it should reasonably have been known to have been unlawful or in excess of lawful authority.
  - The prevailing party in an action brought pursuant to this chapter may be entitled to reasonable costs and attorney's fees.
  - No cause of action is created for relief from unintentional procedural or ministerial errors of an agency.
  - Invalidation of any regulation in effect prior to the date an application for a permit is filed with the agency shall not constitute a cause of action under this chapter.

How Critical Areas Ordinances Impact Development

- Critical Areas Ordinances can affect undeveloped properties and the development of properties that have been developed.
  - Permits or activities requiring a permit.
    - Any activity that requires a permit can trigger the requirements for critical areas determinations.
    - Properties developed prior to 1990, or prior to the implementation of a Critical Areas ordinance, are exempt unless activities requiring a permit are conducted or are planned to be conducted. However, installing a well, or septic system (or replacing a septic system) and other activities can trigger permit requirements. Landscaping is often exempt, but be careful – only certain activities are exempt for "grandfathered" properties. Also be careful with docks. Even if the activity is exempt from critical areas or the SMP, you will still need to determine if a HPA or JARPA is required.
    - Conducting activities on a property that require a permit (often associated with unpermitted grubbing and clearing, or tree removal activities) even though a permit was not issued, can (and usually does) trigger critical areas studies requirements. These are often associated with mandatory restoration activities. This can include the installation of water wells and septic systems.

How Critical Areas Ordinances Impact Development (Cont'd.)

- Subdivisions
- Even though a property will not be developed, the submittal of a short plat or other subdivision request can trigger critical areas requirements (and SEPA).
  - Can be a simple checklist form that will be reviewed to determine if a critical areas study will be required.
  - A critical areas study can be required if municipal or county critical areas or sensitive areas maps suggest critical areas are located on or near property.
  - Installation of a well or septic system.
  - SEPA checklist or more comprehensive SEPA studies may be required.

SEPA (State Environmental Protection Act)

- Comprehensive Plans.
  - Comprehensive Plan changes can require a SEPA checklist and may trigger the need for Critical Areas studies, especially if there will be a new Urban Growth Area (UGA) added to a municipality or county.
  - Annexation of a UGA or existing county "town" may also trigger SEPA and Critical Areas requirements.
- Zoning Changes.
- Zoning changes will trigger SEPA and may trigger Critical Areas requirements.
- Urban Growth Area designation.
- When an unincorporated area is added to a county or municipality's Urban Growth Area, SEPA is usually required and Critical Areas requirements may be triggered.

SEPA (Cont.)

- Any governmental or private action paid for with government funds that can impact the environment, compared to doing nothing at all, and must include **cumulative effects.**
- Can range from simple checklist to more requirements, from an environmental assessment to an environmental impact statement – virtually the same as the National Environmental Protection Act (NEPA), but limited to non-NEPA activities. NEPA is triggered for all federal actions or federally-funded actions, including grants to fund an action, such as "stimulus" monies. This impacted the City of Duvall, which solicited federal funding for "Main Street" modifications, because NEPA (and other federal requirements for those who use federal monies) were not completed.
- SEPA can be triggered by federal actions if NEPA is **not**, because state environmental requirements do apply to federal agencies and federal actions; this usually occurs when the State regulations are more restrictive than the federal regulations, and when the State is authorized to administer federal programs (such as Ecology's ability to administer provisions of the Clean Water Act, but not all provisions).

Critical Areas Impacts to Property Development (Cont.)

- Wetlands
  - Is it a wetland or not? This is the first big question, but if it is, the wetland area can be completely restricted from any development whatsoever; however, as will be discussed later, many non-wetland areas are being identified as wetland areas either because of errors made by the delineator, lack of knowledge of the regulations by the delineator, or on purpose because more money can be made by a wetland delineator if wetland areas are identified. This includes agencies such as the DDES, which is a self-funded monopoly – which means finding critical areas present on a property adds a lot of revenues to the agency, especially at the going rate of $142.25 per hour, which is higher than typical industry standards.
  - Category I – III (or equivalent) wetland area are usually prohibited development areas. The buffers for these wetland areas are also usually prohibited from being developed. In addition to the wetland area and buffers, building setbacks are often required. Buffers can be up to 300 feet from the wetland boundary.

Critical Areas Impacts to Property Development (Cont.)

- In some municipalities and counties, Category IV (or equivalent) wetland areas may have options that allow filling of the wetland area, but mitigation is often required.
- In most cases (other than Category IV wetland areas), the wetland area cannot be reduced without additional studies that indicate the wetland area is smaller or that the initial wetland studies were erroneous and no wetland areas actually exist.
- In some cases, wetland areas (except Category I wetland areas) can be removed by using offsite wetland banking.
- In general, wetland buffers can be reduced through mitigation measures, however, there are usually minimum buffer requirements.
- All critical areas ordinances have a reasonable use provision that allows development regardless of the critical areas present; but this has limitations, and some municipalities interpret this in very unique ways, including forcing property owners to purchase mitigation bank credits, which is not what GMA intended.

Critical Areas Impacts to Property Development (Cont'd.)

- Rare Category I Wetland Area (rare in the Puget Lowlands – Bog and Fen Wetland Area in Canada)

Critical Areas Impacts to Property (Cont.)

- Fish and Wildlife Habitat Conservation Areas
  - Streams and Ponds (in the Shoreline Management Act, since 2010, includes rivers, lakes, and other shoreline areas).
- Aquifer Recharge Areas
  - Primarily impact commercial and industrial development, except in Seawater Intrusion Protection Zones (SIPZs).
- Sole Source Aquifer
  - Impact placement of wells, septic systems, and other activities that could impact "ground water quality"
- Geologic Hazards
  - Steep slope, landslide, seismic, etc. All can result in restrictions being placed on property development.

Best Available Science (BAS)

- What is BAS? Who requires it? Who defines it?

- Growth Management Act, Revised
  - In 1995 the GMA was amended to require counties and cities to include the best available science in developing policies and development regulations to protect the functions and values of critical areas. All counties and cities in the State are required to review, evaluate, and, if necessary, revise their critical areas ordinances according to a schedule established by the state Legislature and approved by the Governor in 2002.
  - Washington State Department of Commerce provides municipalities with a handbook and a list of BAS they can use, however, does this really meet the intent of the GMA, and does it meet the requirements of the Clean Water Act? - http://www.commerce.wa.gov/site/418/default.aspx.
- **Chapter 365-195 WAC Growth Management Act — Best Available Science**
  - PART NINE

    BEST AVAILABLE SCIENCE 365-195-900 Background and purpose. 365-195-905 Criteria for determining which information is the "best available science." 365-195-910 Criteria for obtaining the best available science. 365-195-915 Criteria for including the best available science in developing policies and development regulations. 365-195-920 Criteria for addressing inadequate scientific information. 365-195-925 Criteria for demonstrating “special consideration” has been given to conservation or protection measures necessary to preserve or enhance anadromous fisheries.

Criteria for Determining BAS

- **WAC 365-195-905**
- No agency filings affecting this section since 2003 **Criteria for determining which information is the "best available science."**
  - *(1) This section provides assessment criteria to assist counties and cities in determining whether information obtained during development of critical areas policies and regulations constitutes the "best available science."*
  - *(2) Counties and cities may use information that local, state or federal natural resource agencies have determined represents the best available science consistent with criteria set out in WAC 365-195-900 through 365-195-925. The department will make available a list of resources that state agencies have identified as meeting the criteria for best available science pursuant to this chapter. Such information should be reviewed for local applicability.*
  - *(3) The responsibility for including the best available science in the development and implementation of critical areas policies or regulations rests with the legislative authority of the county or city. However, when feasible, counties and cities should consult with a qualified scientific expert or team of qualified scientific experts to identify scientific information, determine the best available science, and assess its applicability to the relevant critical areas. The scientific expert or experts may rely on their professional judgment based on experience and training, but they should use the criteria set out in WAC 365-195-900 through 365-195-925 and any technical guidance provided by the department. Use of these criteria also should guide counties and cities that lack the assistance of a qualified expert or experts, but these criteria are not intended to be a substitute for an assessment and recommendation by a qualified scientific expert or team of experts.*

Criteria for Determining BAS (Cont.)

- *(4) Whether a person is a qualified scientific expert with expertise appropriate to the relevant critical areas is determined by the person's professional credentials and/or certification, any advanced degrees earned in the pertinent scientific discipline from a recognized university, the number of years of experience in the pertinent scientific discipline, recognized leadership in the discipline of interest, formal training in the specific area of expertise, and field and/or laboratory experience with evidence of the ability to produce peer-reviewed publications or other professional literature. No one factor is determinative in deciding whether a person is a qualified scientific expert. Where pertinent scientific information implicates multiple scientific disciplines, counties and cities are encouraged to consult a team of qualified scientific experts representing the various disciplines to ensure the identification and inclusion of the best available science.*
- *(5) Scientific information can be produced only through a valid scientific process. To ensure that the best available science is being included, a county or city should consider the following:*

*(a) **Characteristics of a valid scientific process.** In the context of critical areas protection, a valid scientific process is one that produces reliable information useful in understanding the consequences of a local government's regulatory decisions and in developing critical areas policies and development regulations that will be effective in protecting the functions and values of critical areas. To determine whether information received during the public participation process is reliable scientific information, a county or city should determine whether the source of the information displays the characteristics of a valid scientific process. The characteristics generally to be expected in a valid scientific process are as follows:*

*1. **Peer review.** The information has been critically reviewed by other persons who are qualified scientific experts in that scientific discipline. The criticism of the peer reviewers has been addressed by the proponents of the information. Publication in a refereed scientific journal usually indicates that the information has been appropriately peer-reviewed.*

Criteria for Determining BAS (Cont.)

- *2. **Methods.** The methods that were used to obtain the information are clearly stated and able to be replicated. The methods are standardized in the pertinent scientific discipline or, if not, the methods have been appropriately peer-reviewed to assure their reliability and validity.*

  *3. **Logical conclusions and reasonable inferences.** The conclusions presented are based on reasonable assumptions supported by other studies and consistent with the general theory underlying the assumptions. The conclusions are logically and reasonably derived from the assumptions and supported by the data presented. Any gaps in information and inconsistencies with other pertinent scientific information are adequately explained.*

  *4. **Quantitative analysis.** The data have been analyzed using appropriate statistical or quantitative methods.*

  *5. **Context.** The information is placed in proper context. The assumptions, analytical techniques, data, and conclusions are appropriately framed with respect to the prevailing body of pertinent scientific knowledge.*

  *6. **References.** The assumptions, analytical techniques, and conclusions are well referenced with citations to relevant, credible literature and other pertinent existing information.*

  *(b) **Common sources of scientific information.** Some sources of information routinely exhibit all or some of the characteristics listed in (a) of this subsection. Information derived from one of the following sources may be considered scientific information if the source possesses the characteristics in Table 1. A county or city may consider information to be scientifically valid if the source possesses the characteristics listed in (a) of this subsection. The information found in Table 1 provides a general indication of the characteristics of a valid scientific process typically associated with common sources of scientific information.*

Table from GMA

Table 1

SOURCE S OF SCIENTIFIC INFORMATION	CHARACTERI STIC S					
	Peer review	Methods	Logical conclusions & reasonable inferences	Quantitative analysis	Context	References
A. Research. Research data collected and analyzed as part of a controlled experiment (or other appropriate methodology) to test a specific hypothesis.	X	X	X	X	X	X
B. Monitoring. Monitoring data collected periodically over time to determine a resource trend or evaluate a management program.		X	X	Y	X	X
C. Inventory. Inventory data collected from an entire population or population segment (e.g., individuals in a plant or animal species) or an entire ecosystem or ecosystem segment (e.g., the species in a particular wetland).		X	X	Y	X	X
D. Survey. Survey data collected from a statistical sample from a population or ecosystem.		X	X	Y	X	X
E. Modeling. Mathematical or symbolic simulation or representation of a natural system. Models generally are used to understand and explain occurrences that cannot be directly observed.	X	X	X	X	X	X
F. Assessment. Inspection and evaluation of site-specific information by a qualified scientific expert. An assessment may or may not involve collection of new data.		X	X		X	X
G. Synthesis. A comprehensive review and explanation of pertinent literature and other relevant existing knowledge by a qualified scientific expert.	X	X	X		X	X
H. Expert Opinion. Statement of a qualified scientific expert based on his or her best professional judgment and experience in the pertinent scientific discipline. The opinion may or may not be based on site-specific information.			X		X	X

X = characteristic must be present for information derived to be considered scientifically valid and reliable

Y = presence of characteristic strengthens scientific validity and reliability of information derived, but is not essential to ensure scientific validity and reliability

What is a Wetland?

- This is not a scientific term, it is a legal/political term for unique features such as marshes, bogs, swamps, fens, and other very unique geomorphologic and hydrologic features, that are very different from each other, but with one thing in common, water. The following is the Clean Water Act and the GMA/SMA definition for a "wetland" (from Page 9 of the State Manual):
- Definition. The Corps of Engineers (CE) (Federal Register 1982), the Environmental Protection Agency (EPA) (Federal Register 1985), the Shoreline Management Act (SMA) and the Growth Management Act (GMA) all define wetlands as:
- *Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.* ***Wetlands generally include swamps, marshes, bogs, and similar areas.*** *In addition, the SMA and GMA definitions add: "****Wetlands do not include*** *those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from non-wetland areas to mitigate the conversion of wetlands."*
- (Note - the different color notation and underlining of the text was purposely placed to emphasize the actual regulatory definition of a wetland in Washington State (including federal); and the single most important feature is the hydrology – saturated soil conditions. By definition, this is the hydrology of a ground water aquifer.

Manuals v Code

- Ecology and many municipalities believe that the Manuals (Corps and State) are "Code" and are enforceable.
- Code is the United States Code (USC), Code of Federal Regulations (CFR), both of which are federal codes.
- State of Washington Code is the Revised Code of Washington (RCW) and the Washington Administrative Code (WAC).
- In California, it is the California Code of Regulations (CCR).
- Washington municipalities refer to their "laws" as code (such as the King County Code (KCC), or the Island County Code (ICC), or the City of Seattle Municipal Code (SMC).
- As an example, the Washington State Wetlands Identification Manual - Ecology, 1997, was "adopted" as field guidance, not 'incorporated" into the law. Ecology has stated that the Manual is "determinative", and the definition of "determinative" is "serving to define." However, in the wetlands Manual itself, on page "v" it states that it is "*not meant to define a wetland.*" The *codes* are the fundamental "laws" that are "legally" binding (and are what are heard in courts) – not the manuals.

Is BAS required for Wetlands?

- In the National Technical Committee for Hydric Soil (NTCHS), latest documents and requirements are established as a requirement of the CWA. It is also required in the State of Washington; from Page 21 of the Washington State Wetlands Identification and Delineation Manual, Ecology, 1997:
- The definition and criteria for hydric soils may change periodically as a result of revisions by the National Technical Committee for Hydric Soils (NTCHS). The most recent NTCHS version should be used.
- BAS is required by the GMA, and to some extent by the CWA.
  - BAS is NOT required in the SMA.
- The science of hydrogeology is fundamental, but is totally excluded from any of the State, Corps, and even NRCS (and NTCHS) manuals, even though wetland hydrology is ground water hydrology.

What was the intent of the regulators for protecting Wetlands?

- Based on the Civiletti Memorandum, 43 Op. Att'y Gen 197 (1979), the only reason the Congress listed for protecting wetland areas is generally the same reason the Congress provided for all water of the Untied States – to "*restore and maintain the chemical, physical, and biological integrity of the Nation's waters*" (33 U.S.C . §1251(a). It should be noted that in Section 404 of the Clean Water Act, this pertained to the placement of fill in wetland areas.
- Subsequently, functions and values for wetlands were identified by agencies, with three primary functions and values being listed by the United States Environmental Protection Agency (http://www.epa.gov/owow/watershed/wacademy/acad2000/wetlands/)
  1. Flood storage - (because wetland areas are typically digressional, they can store minor to moderate flood flows).
  2. Pollution prevention - some studies suggest that wetland areas will remove pollutants from surface water flows that pass through these features.
  3. "Unique" habitat functions.

Wetland Impacts to Property Owners (Cont.)

- It wetland areas identified on or within 300 feet of property, can permanently remove this property from use (unless offsite mitigation is conducted).
- Buffers can be modified, wetlands cannot, except in a few municipalities (Category IV wetland areas).
- If the wetland is jurisdictional, the Corps can and sometimes, will be involved. It is jurisdictional if it has a "significant nexus" with Waters of the United States.
- Although the GMA includes a "reasonable use clause" the CWA does not. This clause is interpreted differently by different municipalities.
- Bottom line, if wetland areas are identified to be present on property, the wetland areas will be permanently removed from use and the buffers will also be difficult to change (most municipalities have a minimum of 25 foot buffers, after mitigation), unless offsite mitigation is allowed and is implemented (WSDOT uses this when necessary, because it is difficult to move roads).

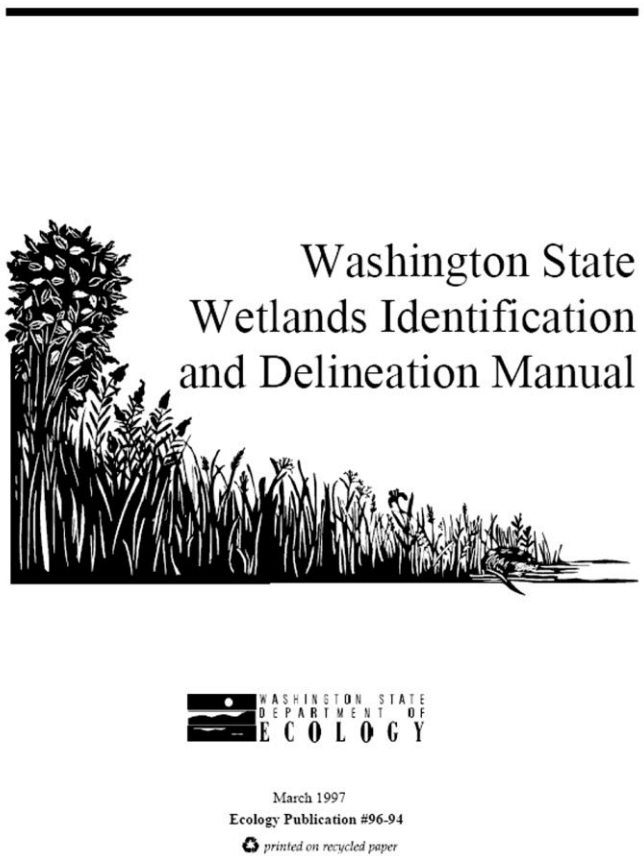
Wetland Impacts to Property Owners (Cont.)

- Some municipalities offset the impacts from wetland areas by allowing development per the zoning (i.e., the City of Duvall). If a property is zoned R-8, and even if half of a one-acre property is determined to be a wetland and buffer system, the property owner MAY still be able to develop 8 residences on the property (using much smaller building pads, however, as there are minimums sizes for building pads). This is rare, and the interpretation for reasonable use is apparently unclear with many municipalities.
- Wetlands located on adjoining properties (including municipally or federally owned properties), can impact properties in their vicinity because of the buffer requirements which vary in different municipalities. Since there is apparently no clear BAS for buffers or building setbacks, different municipalities chose different buffer. This appears to be highly influenced by the Washington State Department of Ecology's (Ecology) influence on Critical Areas ordinances (ordinances that must be approved by Ecology and other State agencies and must also undergo SEPA determinations).

Wetland BAS – It may not be what is being used.

The Manual, published in 1997, is based exclusively on the "science" from the Corps of Engineers Wetlands Delineation Manual, 1987.

Hydric soils are based on color alone, and there is no description of what organic hydric soil really is (no comparison to normal forest litter, duff, and humus) and the description of an aquic moisture regime does not match that of the NTCHS.

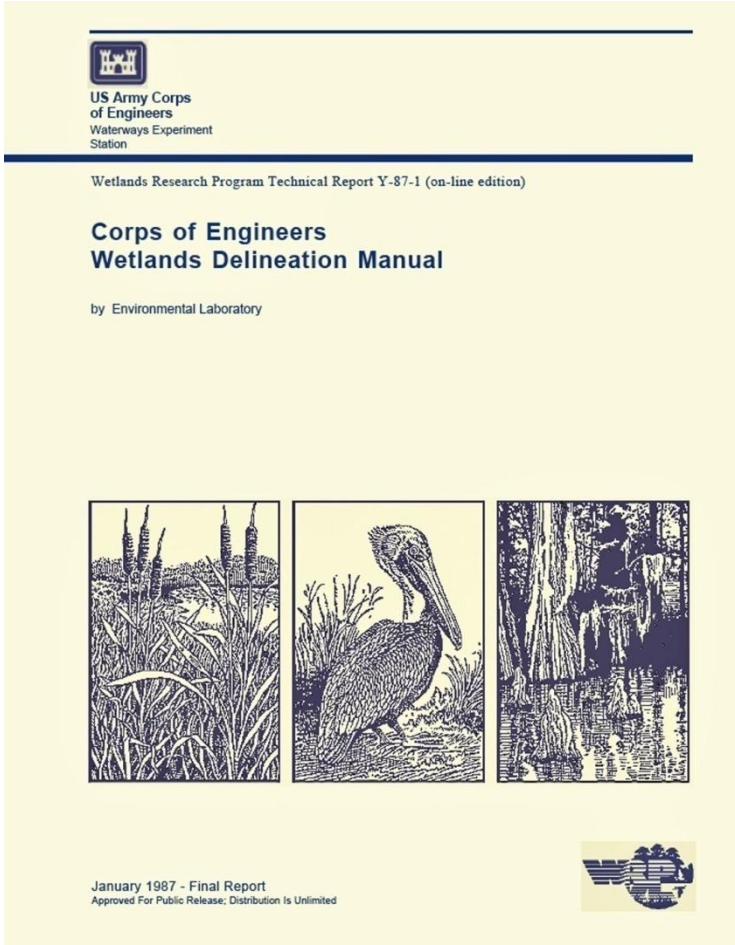


Neither the State or Corps Manuals meet the GMA requirements for BAS.

The GMA REQUIRES the use of this Manual, however, most wetland scientists ignore its rules, such as the requirement for following the latest NTCHS publications for hydric soils, and the requirement that the soil be moist when determining color. Also, as will be discussed later, most wetland scientists do not identify the type of hydric soil they have studied.

The First "Clean Water Act" Wetland Delineation Manual

A later version was released, but was eventually abandoned due to issues with science and the applicability in "jurisdictional" wetlands. This required the Corps to revert to using this manual, which admits that the vegetation indicators are highly biased, and does not require the delineator to prove that the vegetation observed are true hydrophytes.

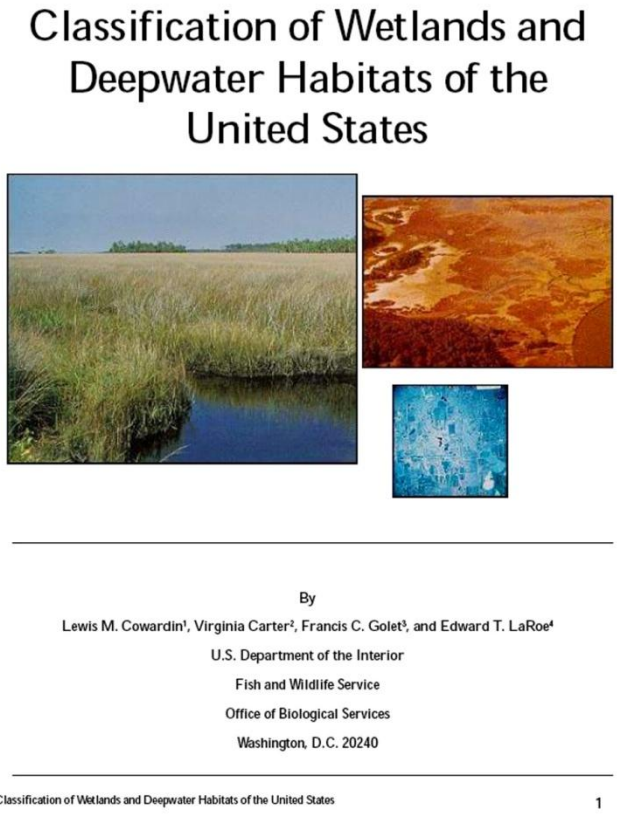


The hydrology sections in this manual indicate that this is the most difficult indicator to identify, and this may be because no hydrogeologists or soil scientists who specialize in ground water hydrology have ever been consulted on any Corps or Ecology wetland manuals. This manual is STILL in use, and the new Regional Manual is a supplement to this manual.

Where it all Started

"Classification of Wetlands and Deepwater Habitats of the United States" (Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. U.S. Fish and Wildlife Service. FWS/OBS - 79/31, 131 pp. The "first" wetland manual under the CWA Section 404 requirements.

This document does not meet current BAS requirements in Washington State **BUT is still used by MANY municipalities.**



Classification of Wetlands and Deepwater Habitats of the United States

By

Lewis M. Cowardin[1], Virginia Carter[2], Francis C. Golet[3], and Edward T. LaRoe[4]

U.S. Department of the Interior

Fish and Wildlife Service

Office of Biological Services

Washington, D.C. 20240

Classification of Wetlands and Deepwater Habitats of the United States 1

The CWA is the principal body of law currently in effect, and was based on the **Federal Water Pollution Control Amendments of 1972** which significantly expanded and strengthened earlier legislation. Major amendments were enacted in the **Clean Water Act of 1977** and the **Water Quality Act of 1987**. The wetland provisions in the CWA (Section 404) originated in the 1977 amendments.

What laws allow your property rights to be ignored?

- NONE.
- The USEPA and Corps of Engineers use the Commerce Clause of the United States Constitution to "override" constitutional guarantees to property owners under the Clean Water Act.
- The State of Washington (and other States) use their Police Power to "override" citizens' federal and state constitutional rights.
  - The 5th and 14th Amendments to the United States Constitution prohibit the taking of private property without compensation.
  - The Washington State Constitution, Article 1, Section 16 provides, in part, that "[n]o private property shall be taken or damaged for public or private use without just compensation." In other words, the government may take private property, but must pay just compensation for the private property that is taken. – (from AG's **Advisory Memorandum:** Avoiding Unconstitutional Takings of Private Property, 12/2006)
  - Article 1, Section 16 also expressly prohibits state and local governments from taking private property for a private use with a few limited exceptions: private ways of necessity and drainage for agricultural, domestic or sanitary purposes. This provision goes beyond the United States Constitution, which does not have a separate provision expressly prohibiting the taking of private property for private use. As discussed in the AG's "Opinion", this clause has been interpreted to prevent the condemnation of property as part of a government redevelopment plan where the property is to be transferred to a private entity.
  - These rights are protected under the California Constitution in Article 1, Declaration of Rights, Section 7.

How it works on the Federal Level (Cont.)

- **Commerce Clause (Federal)**
  - The **Commerce Clause** is an enumerated power listed in the United States Constitution (Article I, Section 8, Clause 3). The clause states that the United States Congress shall have power "To regulate Commerce with foreign Nations, and among the several States, and with the Indian Tribes". Courts and commentators have tended to discuss each of these three areas of commerce as a separate power granted to Congress. It is common to see the Commerce Clause referred to as "the **Foreign Commerce Clause**," "the **Interstate Commerce Clause**," and "the **Indian Commerce Clause**," each of which refers to a different application of the same sentence in the Constitution.
  - Dispute exists as to the range of powers granted to Congress by the Commerce Clause. As noted below, the clause is often paired with the Necessary and Proper Clause, the combination used to take a broad, expansive perspective of these powers. Many strict constructionists deny that this is the proper application of the Commerce Clause because it refers specifically to "the foregoing Powers".

How it works on the State Level

- **Police Power** (from AG's **Advisory Memorandum:** Avoiding Unconstitutional Takings of Private Property, 12/2006)

- ***"Police Power." State governments have the authority and responsibility to protect the*** public health, safety, and welfare. This authority is an inherent attribute of state governmental sovereignty and is shared with local governments in Washington under the state constitution. Pursuant to that authority, which is called the "police power," the government has the ability to regulate or limit the use of property.
- Police power actions undertaken by the government may involve the abatement of public nuisances, the termination of illegal activities, and the establishment of building codes, safety standards, and sanitary requirements. Government does not have to wait to act until a problem has actually manifested itself. It may anticipate problems and establish conditions or requirements limiting uses of property that may have adverse impacts on public health, safety, and welfare.
- Sometimes the exercise of government police powers takes the form of limitations on the use of private property. Those limitations may be imposed through general land use planning mechanisms such as zoning ordinances, development regulations, setback requirements, environmental regulations, and other similar regulatory limitations. Regulatory activity may also involve the use of permit conditions that dedicate a portion of the property to mitigate identifiable impacts associated with some proposed use of private property.
- ***Regulatory Takings. Government regulation of property is a necessary and accepted*** aspect of modern society and the constitutional principles discussed in this ***Advisory Memorandum do not require compensation for every decline in the value of a piece of private*** property. Nevertheless, courts have recognized that if government regulations go "too far," they may constitute a taking of property. This does not necessarily mean that the regulatory activity is unlawful, but rather that the payment of just compensation may be required under the state or federal constitution. The rationale is based upon the notion that some regulations are so severe in their impact that they are the functional equivalent of an exercise of the government's power of eminent domain (i.e., the formal condemnation of property for a public purpose that requires the payment of "just compensation").

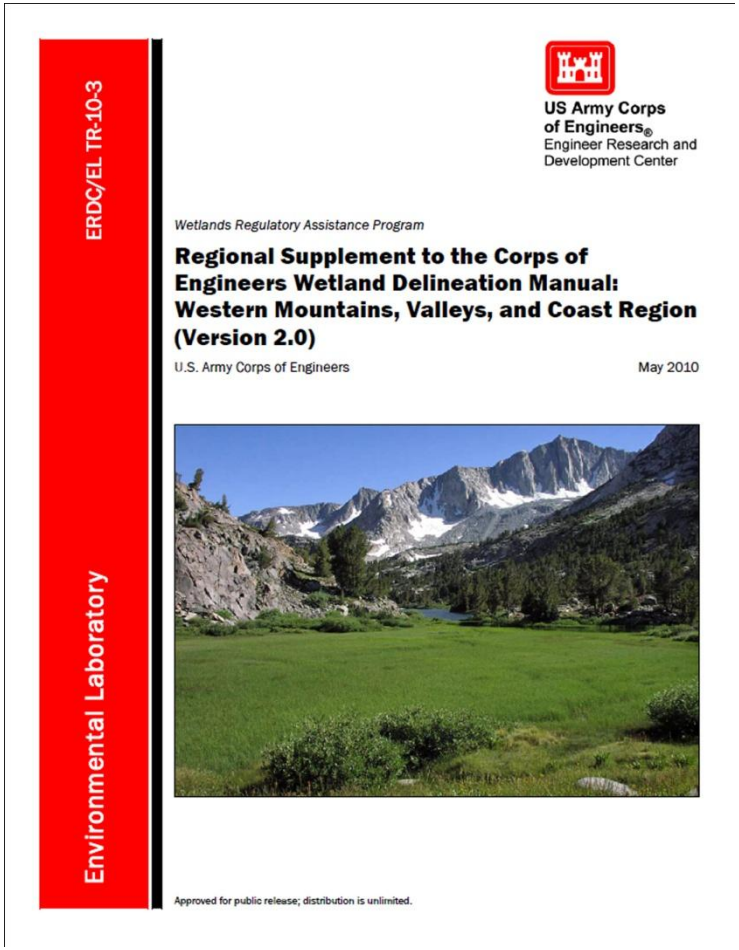
GMA and Federal Regulations

- In general, the GMA Ecological and Environmental codes are redundant, since cover regulations already addressed in the CWA (including water quality – sole source aquifers and aquifer recharge areas).
- The GMA nor the SMA cover some provisions of the CWA, including Section 401 and 402, which is why problems can arise, especially with stream determinations. There is no state or federal definition for a stream, but there are exemptions for non-streams. This becomes complex, especially when a municipality does not want to install the required infrastructure or does not want to be regulated under these two provisions of the CWA. Portions of a municipality's storm sewer system can be regulated under a federal permit, which changes how this surface water can be handled and discharged.
- Technically, the "State" only regulates those wetlands that are determined to be isolated, and do not have a significant nexus with Waters of the United States.
- Additionally, although the State has established "Waters of the State" and "Shorelines of the State", if these waters have a significant nexus with Waters of the United States, Federal regulations can "trump" State regulations.
- Although specifically exempted from the Critical Areas ordinances, many wetland detention facilities and storm water ditches (and other manmade features) are identified as critical areas (SNR has observed Ecology making wetland determinations in manmade drainage ditches knowingly, and consciously ignoring the requirements set forth in the GMA and in the CWA for identifying wetland areas; including ignoring the requirements for identifying hydric soils and wetland hydrology).
- The GMA and SMA do not include CWA regulations that pertain to surface water quality and point source contaminants or discharges to "receiving waters" – this is covered under Sections 401, 402, and other provisions of the CWA. However, Section 402 does require that many municipalities obtain and have a permit for the municipal separate storm sewer system (MS4), as a Municipal Storm Water NPDES Permit (National Pollutant Discharge Elimination System), either Phase I or Phase II.

Current Manuals

- Per the Corps of Engineers, the 1987 Corps of Engineers *Wetlands Delineation Manual* AND U.S. Army Corps of Engineers. [May] 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0), ed. J. S.* Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-3. Vicksburg, MS: U.S. Army Engineer Research and Development Center. Both manuals MUST be used together. However, this manual uses the NTCHS, United States Department of Agriculture, Natural Resources Conservation Service. 2006. *Field Indicators of Hydric Soils in the United States*, Version 6.0. G.W. Hurt and L.M. Vasilas (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils. Additionally, the Corps Manuals state that the most recent version of the NTCHS manuals MUST be used.
- The NTCHS has revised the Field Indicators of Hydric Soils in the United States (Version 7), which became available around August 2010. This document is entitled, United States Department of Agriculture, Natural Resources Conservation Service. 2010. *Field Indicators of Hydric Soils in the United States,* Version 7.0. L.M. Vasilas, G.W. Hurt, and C.V. Noble (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils. This manual is different and has different requirements, including the mandatory use of the "Keys to Soil Taxonomy" to properly identify different types of soils that have developed hydric soil characteristics (e.g., page 9; *See Keys to Soil Taxonomy (Soil Survey Staff, 2010) for a complete definition*). Without a complete definition, it is impossible to correctly identify the soil as having all of the required characteristics to be identified as being a soil that has developed a specific type of hydric soils characteristic. In the case discussed above, histosols - organic "hydric" soils (some being described by the soil service as muck) such as peats, (sapric soil material), mucky peat (hemic soil material), and peat (fibric soil material) are being discussed, which requires an aquic moisture regime. The "Keys" dedicates numerous pages to aquic conditions or moisture regimes, including discussions on unsaturated zone bypass flows, which, as stated in the "Keys", are not ground water flows. It should be noted that non-hydric organic soils are also called fibric, hemic, and saphric; the only difference between these materials, that occur in upland forests from hydric materials in "wetlands", is the hydrology (which must be aquic and is defined as ground water hydrology, that is also anaerobic and reducing), AND that these organic materials must form in saturated conditions that are also anaerobic and 'reducing' conditions.
- The NTCHS/NRCS (National Resource Conservation Service – formerly the Soil Conservation Service) released two new documents after the Corps released their final version of the Regional Supplement to the Corps Manual, which means that the May 2010 Corps manual no longer includes the BAS for hydric soils or for wetland hydrology.

New Corps Supplement



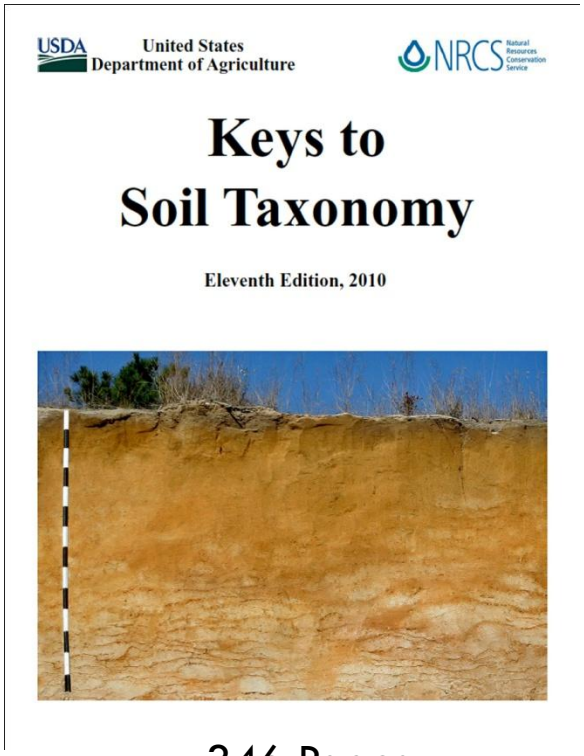
153 Pages

New NRCS/NTCHS Documents

New NTCHS Required Document

53 Pages

New NRCS Required Document



346 Pages

Water Bodies

- Streams, Ponds, and Lakes (Fish and Wildlife Habitat Conservation Areas and Shorelines, depending on size).
- Scientifically, rivers are large streams, however, regulatorily, they have differences as do ponds and lakes (lakes are ponds that are 20 acres in size or larger, rivers are streams with specific sustained flows or widths);
  - Critical Areas ordinances require setbacks for streams.
    - There are 2 types of regulatory streams - perennial and intermittent (seasonal). So far, ephemeral streams have been exempt because they do not provide fish and wildlife habitats (they only flow when there is sufficient precipitation to cause surface sheet flows).
    - As previously discussed, federal and state laws, including WAC 222.16.030 do not provide definitions for a regulated stream (the WDFW regulations include a definition for a "waterway", but not a critical areas stream). Many municipalities do have definitions for a critical areas stream, however, it appears that the origin of this definition is unknown. King County has no definition, nor do some other municipalities; however, some do, and they are similar.
  - If a stream is a shoreline of the State, it cannot be regulated by critical areas, per the 2010 revisions to the SMA. This is also true for ponds greater than 20 acres in size, and for marine shorelines (and other water bodies, such as some sloughs).

Other Critical Areas and Regulations that Impact Property Use

- As discussed in this course, there are many other Critical Area per the GMA and now, per the SMA (although it is unclear what these will be called) that can impact property use.
- There are other State and Federal regulations that can also impact property use, however, this course focuses on the Critical Areas, which incidentally, also include several Federal regulations, since many of the critical areas in the GMA are redundant with Federal regulatory programs that have similar restrictions.

Water Bodies (Cont.)

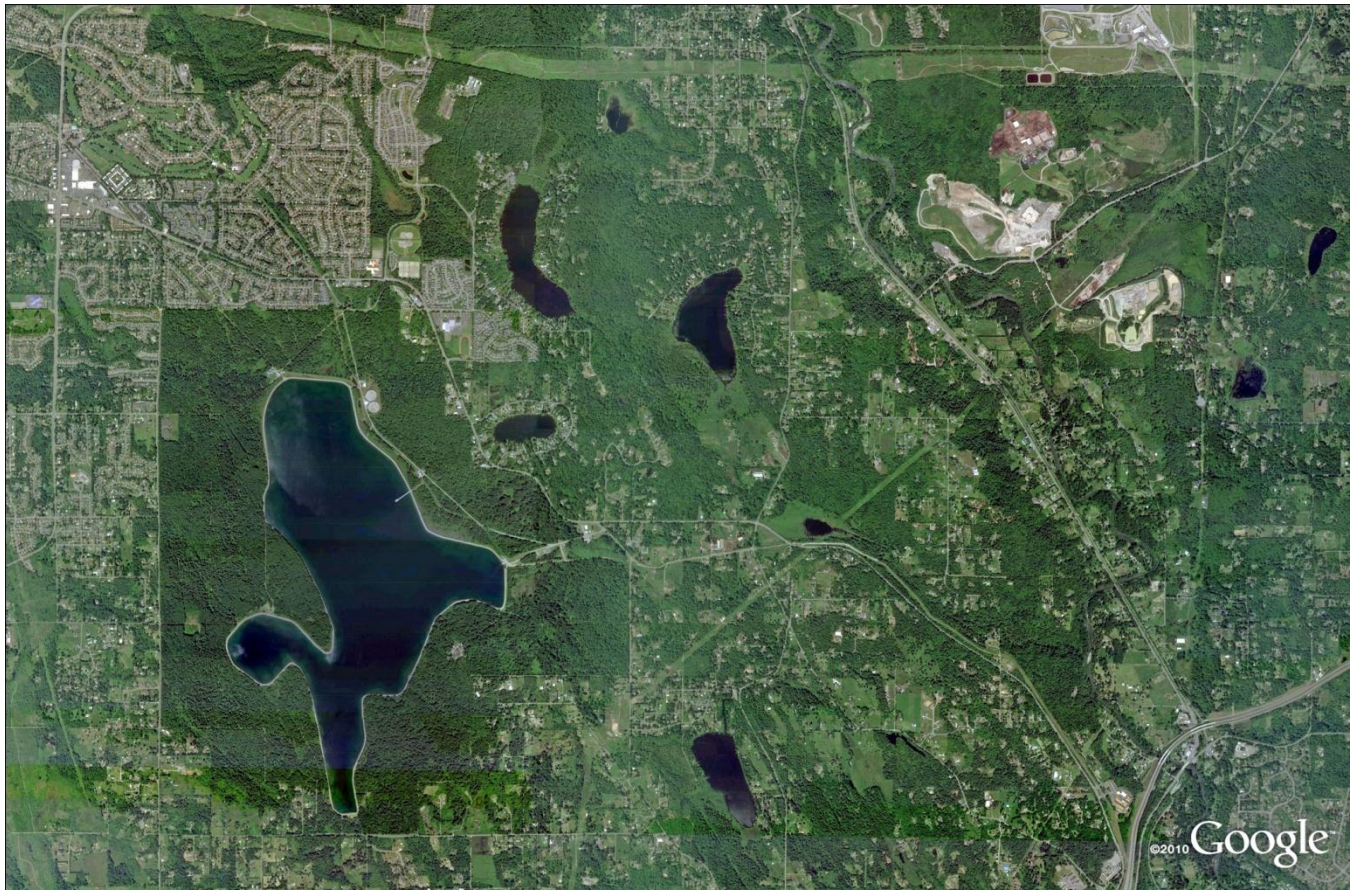
- Most ordinances now use WAC 222.16.030 to "type" streams. Some even use this to type ponds and lakes. However, as previously mentioned, this "Code" does not include a definition for a stream.
- Most stream studies do not include the scientific studies required to determine if a channelized water body is a stream or not. Most studies assume that a water body is a stream and commence with typing – even though there are exemptions under the critical areas ordinance for specific types of manmade water bodies that were not natural water bodies before they were manmade conveyances. Some municipalities automatically classify fish bearing water bodies as streams, however, this can result in violations of the Endangered Species Act (ESA) if these conveyances are actually 'regulated point source conveyances' (especially if the municipality has a federally-issued Municipal Storm Water Permit).
- Some construction activities are allowed in streams and stream buffers. However, the National Marine Fisheries Service (NMFS) Consultation with the FEMA, September 22, 2008, curtails any activities in the floodway and greatly limits any activities in the 1% floodway.
- Streams can sometimes be moved and can generally be crossed, but the NMFS consultation with the FEMA can restrict this (under the ESA).
- Streams (rivers are large streams) are regulated by critical areas and can be regulated by other regulations and ordinances, including RCW 77 if the stream or river has fish present. There are more restrictions if TES are present. Rivers were formerly regulated by the Critical Areas, but this was changed in 2010, when the SMA was changed.
- Stream (and some lakes) setbacks can be up to 300 feet.

Water Bodies (Cont'd.)

Storm Water Ditch

Stream – Tributary to the Skykomish

Lakes and Ponds Southeast of Renton

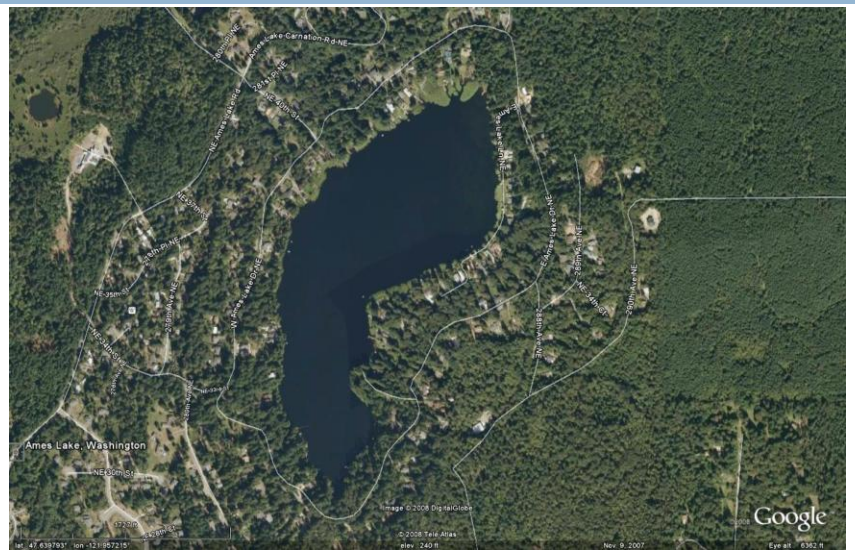


Water Bodies (Cont'd.)

- Shorelines of the State (including lakes) automatically have protective zones 200 feet from the ordinary high water mark (OHWM), but development setbacks vary depending on the County/municipality shoreline master plan (SMP). Some setbacks are as little as 25 feet. Changes to the SMA now clarify that shorelines are not regulated by critical areas ordinances (this change is retroactive).
- Setbacks (sometimes called buffers for critical areas) for ponds under 20 acres are based on critical areas (fish and wildlife habitats; however, King County created a specific "critical area" for ponds and lakes 20 acres or greater in size – "aquatic areas". These setbacks required for ponds vary, and are not applicable to manmade ponds, especially storm water detention facilities.
- Streams can have wetland fringes or can connect wetland areas, making the streams become part of a wetland complex, with wetland restrictions as well as stream restrictions.
- Ponds and lakes can have wetland fringes, especially where streams enter them. However, since 2010, each are regulated differently, and the presence of these wetland areas water-ward of the OHWM means that only the buffers can potentially impact a property. The OHWM is NOT a scientific boundary, it is a common, law-established boundary that determines property lines, and where a water body becomes the property of the "people". In the Puget Lowlands, however, there are many ponds that are "technically" private (because the property lines historically extended to the center of this water body), but many municipalities have apparently "penetrated" this "private property" and have included these lakes and ponds under Critical Areas and Shoreline regulations). Ask the attorneys and your regulators how this happens, but, in many cases, the WDFW purchased one lot on a private lake to "de-privatize it", however, on Phantom Lake, a court decision limited the WDFW public access to no more than an individual property owner would have.

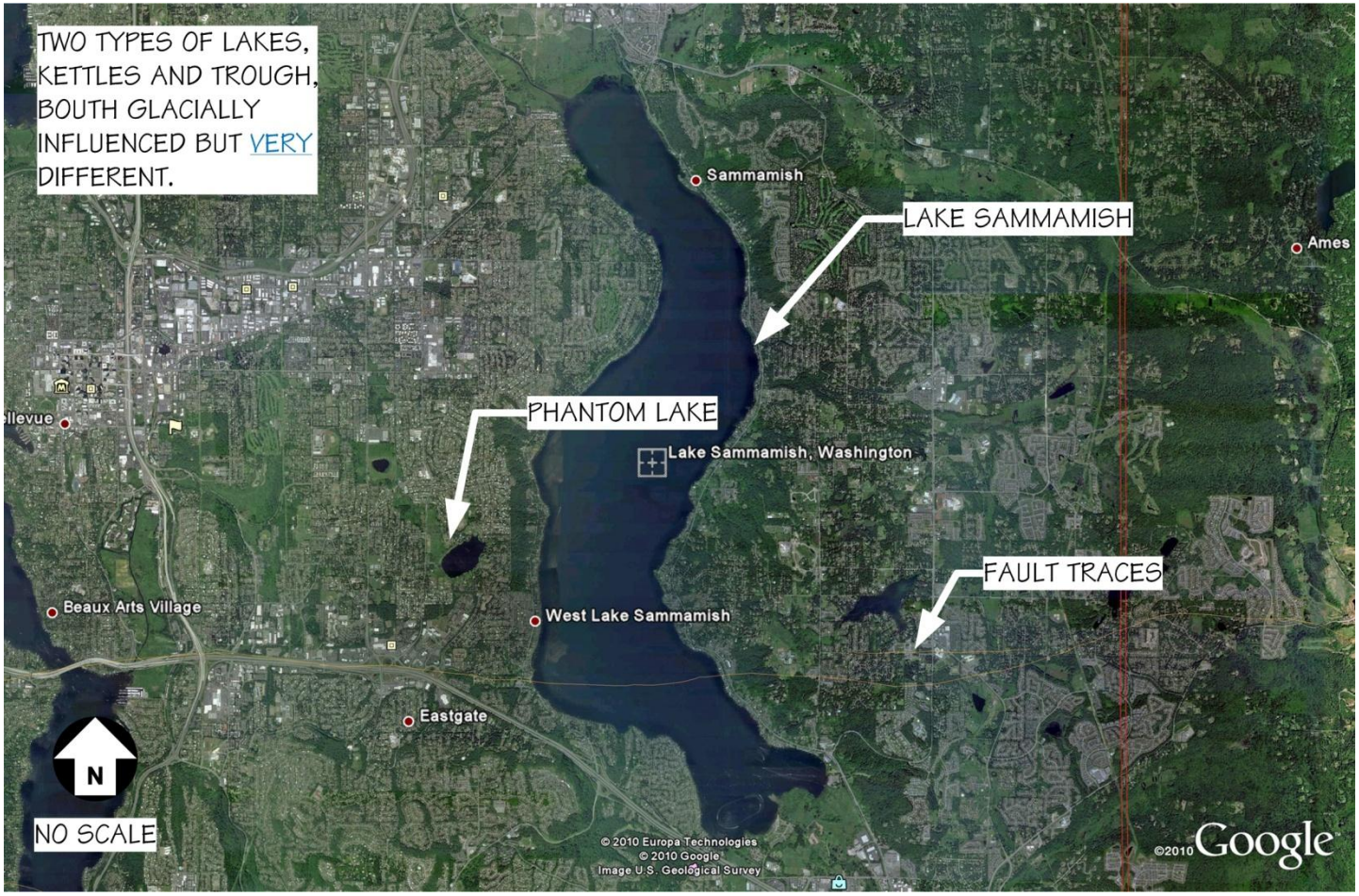
Water Bodies (Cont'd.)

AMES
LAKE
True Lake



LONG
LAKE
Pond

Different Types of Lakes



Other Critical Areas

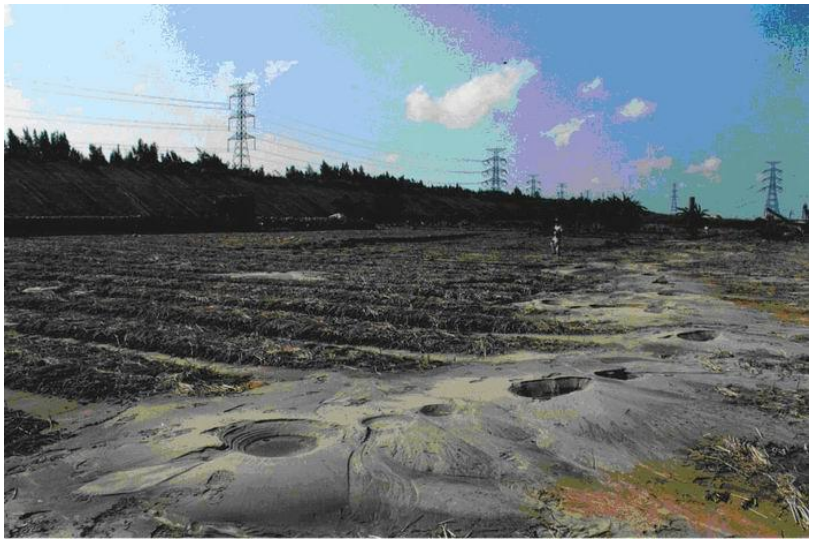
- All Critical Areas can impact property use, some more than others, and now these impacts will move to shorelines due to changes (2010) to the SMA.
- In general, Geologic Hazards should not have the same impacts that ecological, or environmental critical areas do, but some municipalities (e.g., Bellevue, and Bainbridge Island), interpret the geologic hazards critical areas differently than most other municipalities.
- In general, most geologic hazards can be addressed, except volcanic geologic hazards (there is no practical way to protect a property from a volcanic hazard).
- Seismic hazards can be addressed, but if a "subduction" earthquake occurs, there is very little that can be done if this is a major event. There are no engineering standards that can protect against a major earthquake, although some can minimize damage.
- Other geologic hazards can be generally addressed through engineering and avoidance.
- Impacts to ground water can be minimized and eliminated if proper protocols are observed, however, impacts to the hydrologic balance (especially to ground water) are actually encouraged by Ecology and other agencies, and this can result in new geologic hazards that did not previously exist (e.g., the Auburn and Kent Valleys).

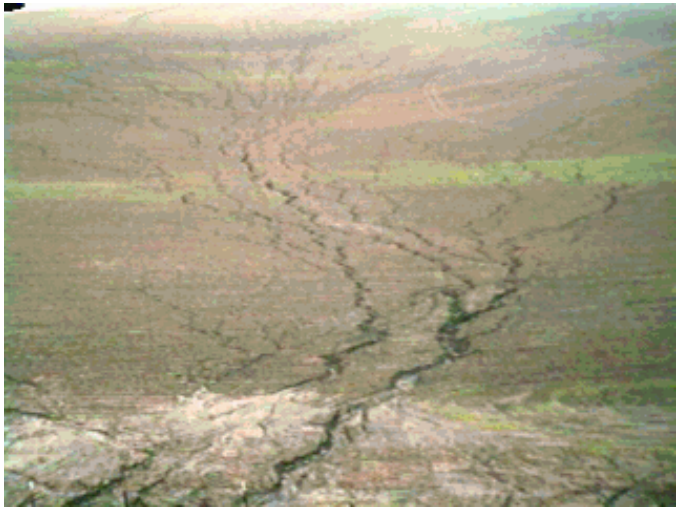
Geologic Hazards

- Geologic Hazards include landslide hazards, erosion hazards, seismic hazards, and other potential hazards (volcano, flood, tsunami, etc.). Erosion hazards are NOT geologic hazards and are based on the NRCS soils classification for farmland and the formation of rills. This is not usually applicable to undisturbed properties.
- Ground disturbances (other than in agriculture) usually occur during development of a property, however, under Section 402 of the CWA, any development that is 1 acre in size or lager must obtain a general construction storm water NPDES permit that must include erosion and sediment controls (and other controls, including treatment), to meet discharge requirements and to prevent erosion from occurring, and these methods must be Best Management Practices (BMP).
- Some municipalities, such as Bellevue, WA have extended this to make all slopes that are greater than 40% automatically "steep slope" hazards, that require mitigation regardless of whether an actual hazard exists. Most engineered slopes (especially road cuts) are usually 2:1 slopes, which are 50% slopes, and these (when they are owned by the municipality) are not automatically considered to be 'critical areas steep slopes'.
- Most geologic hazard critical areas ordinances require setbacks from steep slopes, or erosion hazard areas (the head and toe of the slope); however, some will allow reductions or elimination of setbacks based on engineering geology or geotechnical engineering studies (and possible engineering solutions).
- Seismic hazards generally pertain to liquefaction potential, but can also include other hazards including tsunami, slope failure, and ground rupture in areas where active faults have been identified to be present. The hazards can also be associated with the level of "acceleration" of the ground "wave", both vertically and horizontally, and the "frequency" of the wave. The acceleration is measured in "gravities", and if the vertical acceleration is greater than 1, there is a good potential that a structure may become airborne, which can result in significant damage. The other factor is the frequency of the seismic wave, which is especially devastating on structures made of several different materials (such as brick and mortar), but if this frequency matches the harmonics of a structure, the structure can be "shaken apart" (i.e., the Tacoma Narrows Bridge from wind frequencies).

Geologic Hazards (Cont'd.)

LIQUEFACTION





SOIL EROSION - RILLS

Other Geologic Hazards

1958 Lituya Bay, Alaska – 1,700 foot tsunami.

Coastal landslide

Fish and Wildlife Conservation Areas

- These are what are used to regulate streams and ponds and in some cases, lakes (prior to the changes in the SMA).
- Different from Shoreline and Federal TES regulations.
- Can affect upland areas if TES or species of special interest are deemed to be present (usually established by the municipality or County and will include State-designated species established by the Department of Natural Resources).
- This critical area can have setback or buffer requirements from the OHWM of up to 300 feet for water bodies. It can restrict building on properties that have TES or species of interest. Equivalent regulations now apply to shorelines.

Waters of the State

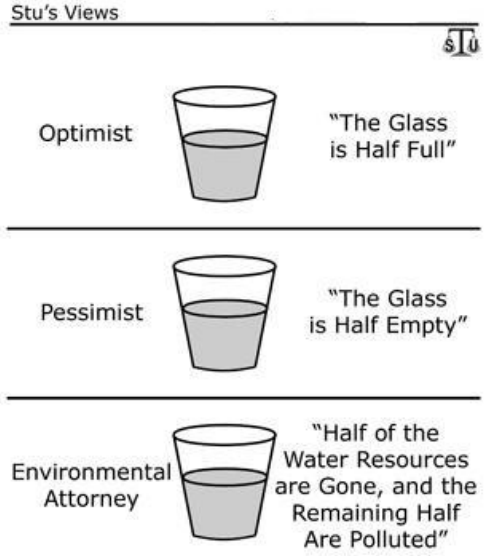
- In general, can be any water body except manmade water bodies. Reservoirs are included as waters of the State and shorelines of the State, but farm ponds, storm water detention facilities, and other storm water related facilities are not.
- Different from shorelines of the State.
- Can require setbacks or buffers, based on habitat and the fish and wildlife that are present.
- Overlaps with Waters of the United States, unless there is no “significant nexus”.

Aquifer Recharge Areas

- Environmental critical area where restrictions are placed on development that will include the storage of dangerous or hazardous materials and wastes in areas where ground water can be impacted.
- Generally do not affect residential development.
- Can affect commercial, industrial, and institutional development.
- Are included in the CWA under Water Quality, and also under the Safe Drinking Water Act.

Wellhead Protection Areas

- Other environmental critical areas established to protect drinking water derived from ground water supplies.
- Generally do not effect development, but can do so under unique circumstances.

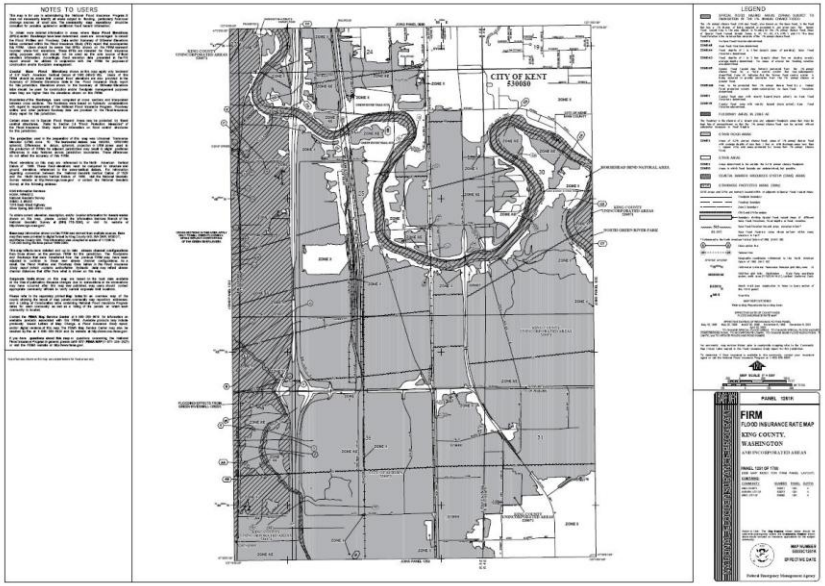


In general, prevent septic systems from being located too close to wells, but also prevent other features or activities that could impact ground water quality near an extraction point.

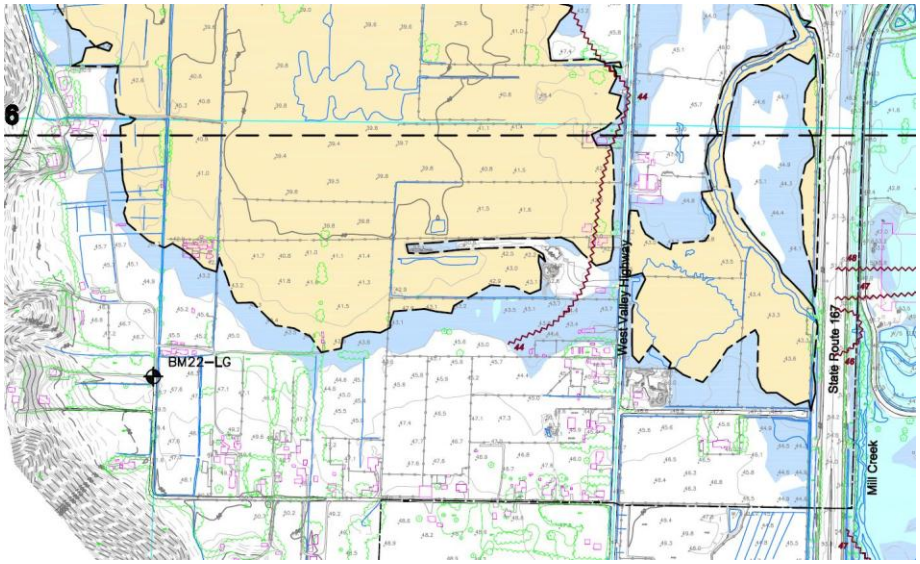
Frequently Flooded Areas

- Related to FEMA flood requirements (to some extent), but the question is, How "frequently" is frequently-flooded"? It is assumed this occurs more frequently than the 1% storm flooding, but there is no clear definition for what "frequently" means.
- Usually impact development in floodplain areas and areas where properties are located on water bodies.
- Some municipalities (Pierce County) require floodplain studies if an area to be developed with structures (including roads) will be in the 100-year floodplain.
- May require setbacks from the 100-year floodplain.
- Based on assumptions and predictions, global warming could dramatically affect these interpretations.
- Can affect those who live on the shoreline of lakes and ponds, especially if these are used by the municipality for storm water management purposes.

Frequently Flooded Ares (Cont.)

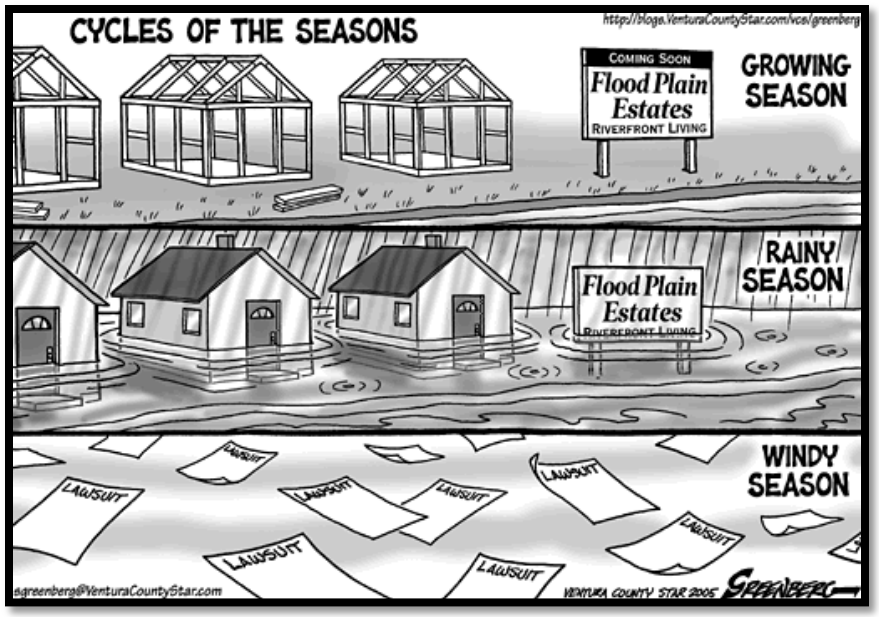


FEMA FLOOD MAP
– AUBURN, WA AREA



KING COUNTY DRAFT FLOOD MAP
– AUBURN, WA AREA

Flooding



Flooding issues are not always associated with building in a floodplain. These can include areas that were not floodplains when developed, but could become floodplains as storm water is diverted into areas, and as river channels accumulate sediments.

Flooding is getting worse in some areas (i.e., the Snoqualmie River Valley, *right*) because of storm water handling practices and regulations that prohibit dredging of rivers.

Authority to Implement Critical Areas Ordinance

- Based on Police Action, to avoid compensating landowners for loss of use of property.
- RCW 36.70A.370 requires Counties and municipalities to be familiar with the *Attorney General's Advisory Memorandum: Avoiding Unconstitutional Takings of Private Property*, December 2006 document.
- Property restrictions associated with Critical Areas can only be implemented in police actions; any other action requires reimbursement to the property owner for the loss of land under Eminent Domain laws.

Break

- 20 Minute Break for Lunch

Critical Areas Methods, Science and Case Studies

- State of Washington Wetlands Identification and Delineation Manual, Ecology, 1997.
- Washington State Wetland Rating System for Western Washington (and Eastern Washington), Ecology, 2004
- Corps of Engineers Wetland Delineation Manual, USACE Environmental Laboratory, 1987.
- CLASSIFICATION OF WETLANDS AND DEEPWATER HABITATS OF THE UNITED STATES, US Fish and Wildlife Service, Lewis M. Cowardin, et al, 1979.
- Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region, USACE, April 2008 (Note: The GMA requires revisions to be made to the State of Washington Wetlands Identification and Delineation Manual due to the final release of this Supplement to the USACE Wetland Delineation Manual by the USACE, and newer documents, previously discussed).
- Publications from the Department of Agriculture, National Resource Conservation Service (NRCS), National Technical Committee for Hydric Soils (NTCHS).
- Best Available Science (BAS) is required by the GMA
- **Conflict between the Corps and the NRCS?**

Where to Begin?

- Meeting Code requirements or guidance documents that are outdated and scientifically incorrect.
- U.S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)*,states (page 2):

  One key feature of the definition of Wetlands is that, under normal circumstances, they support "a prevalence of vegetation typically adapted for life in saturated soil conditions."

  This is directly from the Federal Code (and is used in ALL the State of Washington Codes, including the GMA and SMA), however, the GMA and SMA include a description of what is NOT a Wetland:

  - RCW 36.70A.030 - *Definition. The Corps of Engineers (CE) (Federal Register 1982), the Environmental Protection Agency (EPA) (Federal Register 1985), the Shoreline Management Act (SMA) and the Growth Management Act (GMA) all define wetlands as: Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. In addition,*

Where to Begin? (Cont'd.)

- The SMA and GMA definitions add: ***"Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas to mitigate the conversion of wetlands."***

- What does saturated soil conditions mean?
  - This is from the Washington State Wetlands Identification and Delineation Manual, Ecology, 1997 Glossary:
    - ***Saturated soil conditions*** *- A condition in which all easily-drained voids (pores between soil particles in the root zone) are temporarily or permanently filled with water to the soil surface at pressures greater than atmospheric.*
  - The following are from other State Codes:
    - *WAC 173-200-020 - Definitions.*
    - *(12) "Groundwater" means water in a saturated zone or stratum beneath the surface of land or below a surface water body."*
    - *WAC 173-218-030 – Definitions*
    - *"Ground water" means water in a saturated zone or stratum beneath the surface of land or below a surface water body."*

Wetland Hydrology is Ground Water Hydrology

- Wetland scientists use the term “near surface hydrology” (HB 1313 and SB 5225).
- Any “near surface hydrology” is, by definition, below-the-surface hydrology, which is ground water hydrology, except for unsaturated zone flows, which, by definition are not ground water hydrology (and are the most common “near surface hydrology” in the Puget Lowlands).
- Saturated soil conditions are pressurized, hydraulic systems, very different from unsaturated soils; these would be called phreatic zones (ground water bearing zones).
- Hydrology is the single most important factor in identifying wetland areas.

Soils

- The wetland definition per the Codes does not mention anything about soils, so why are soils one of the three wetland indicators (wetland vegetation, soils, and hydrology)?
- The Code states: "*water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.*"
  - The Corps included soils so the agency could conduct desktop wetland "delineation" studies, without ever "stepping" into the field and determining that "at a frequency and duration sufficient" is difficult and time-consuming without applying the hydrogeologic sciences.
  - The Corps rationale is that hydric soils only form after long periods of continuous soil saturation, under anaerobic and reducing conditions.
  - By using NRCS soils maps, that suggest soils are present in an area that can develop "hydric soil" characteristics, the Corps can imply that these are "wetland soils" and therefore the Corps assumes a wetland is present, even if the hydrology or soils have not been confirmed in the field.

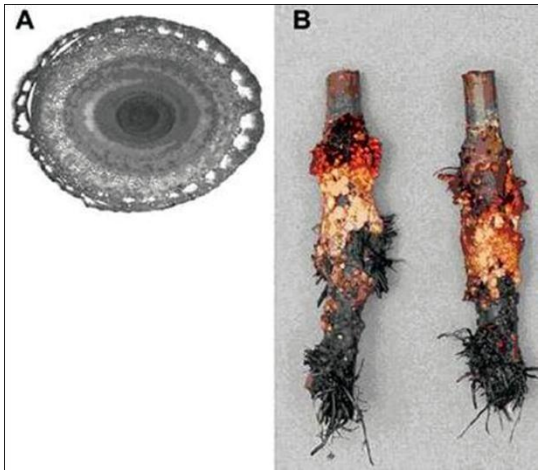
Vegetation

- The Congress also required "vegetation" in its definition of a regulatory wetland: *a prevalence of vegetation typically adapted for life in saturated soil conditions*. This means that the majority of the vegetation must be adapted to living in saturated soils, and by definition, to be saturated long enough these soils must be anaerobic and have developed reducing conditions.
- The type of plants that live in saturated soils "must have adapted" and the plants that have these adaptations are called hydrophytes. The following slide provides the Corps' definition for hydrophytes and the adaptations.

Hydrophytes

- The following are the Corps of Engineers' 1987 definitions for hydrophytes and their adaptations:
- **Hydrophyte - Any macrophyte that grows in water or on a substrate that is at least periodically** deficient in oxygen as a result of excessive water content; plants typically found in wet habitats.
- **Hydrophytic vegetation - The sum total of macrophytic plant life growing in water or on a** substrate that is at least periodically deficient in oxygen as a result of excessive water content. When hydrophytic vegetation comprises a community where indicators of hydric soils and wetland hydrology also occur, the area has wetland vegetation.
- **Hypertrophied lenticels - An exaggerated (oversized) pore on the surface of stems of woody** plants through which gases are exchanged between the plant and the atmosphere. The enlarged lenticels serve as a mechanism for increasing oxygen to plant roots during periods of inundation and/or saturated soils.
- This means that only plants (e.g., trees, shrubs, and herbs, or the scientific term, macrophytic) with adaptations can survive in wetland hydrology and soils and these plants are called hydrophytes.

Examples of Adaptations



These adaptations allow the "hydrophyte" to transfer oxygen to the plant roots. Not all hydrophytes can live in wetland soils; some require oxygenated water (that is not reducing), such as oligotrophic lake vegetation.

Science (Cont.)

RED ALDER

WESTERN RED CEDAR

REED CANARYGRASS

ALL OF THESE QUALIFY AS HYDROPHYTIC WETLAND *VEGETATION* IN THE MANUALS, AND IF DOMINANT , WOULD BE CONSIDERED TO BE WETLAND INDICATORS

SKUNK CABBAGE

Science (Cont.)

EACH OF THESE SITES HAVE BEEN DELINEATED AS CATERGORY II WETLAND AREAS BY WETLAND SCIENTISTS

Statement from the NRCS

- From: Natsuhara, Chuck - Puyallup, WA [mailto:Chuck.Natsuhara@wa.usda.gov]
  Sent: Wednesday, January 21, 2009 3:50 PM
  To: steve@snrcompany.com
  Cc: Flanagan, Clare - Renton, WA
  Subject: NRCS Soil Survey of King County, WA

  Steve Neugebauer,

  Your email to Clare Flanagan was forwarded to me. I will try to answer you questions.

  For King County the Snoqualmie Pass Soil Survey (published Dec. 1992) mapped the eastern portions of private forest land that were not mapped in the 1973 King County survey. No update of the 1973 King County soil survey has been conducted. Both soil surveys are an order 2 soil survey mapped at a scale of 1:24000. You are correct in that the smallest delineation is approx. 3 acres (more typically 5 acres). This is usually for a map unit that is strongly contrasting from its surrounding map unit such as a wet area. Field mapping was not conducted on every delineation. Aerial photography, geology maps, topographic maps, climate data and other information was used to allow the soil scientists to develop concepts on where different soil series were likely to be found. Mapping was conducted remotely with ground truthing to check that the concepts were correct. As different soils were found, more soil investigations were made to adjust the concepts of where the soils
  were on the landscape.

  Soil surveys are good for general, wider area planning. They will give you a good basis for what to expect in terms of soils. **They are not meant to be used for site specific soils information where design or regulatory questions need to be answered. In those cases it is best to have the soils confirmed on site by a soil scientist.**

  Here is the technical reference for the different orders of soil mapping found in the Soil Survey Manual.

  http://soils.usda.gov/technical/manual/tables/table2-1.html

  I hope I answered your questions. Let me know if you have any others.

  Chuck Natsuhara
  Area Soil Scientist
  253-845-9272 x108

Use of Science (Cont'd.)

Soil color alone is not conclusive, using the NTCHS methods for determining if a soil has developed hydric soil characteristics. *This is taken from the 2010, Version 7, of the "Field Indicators" Manual.*

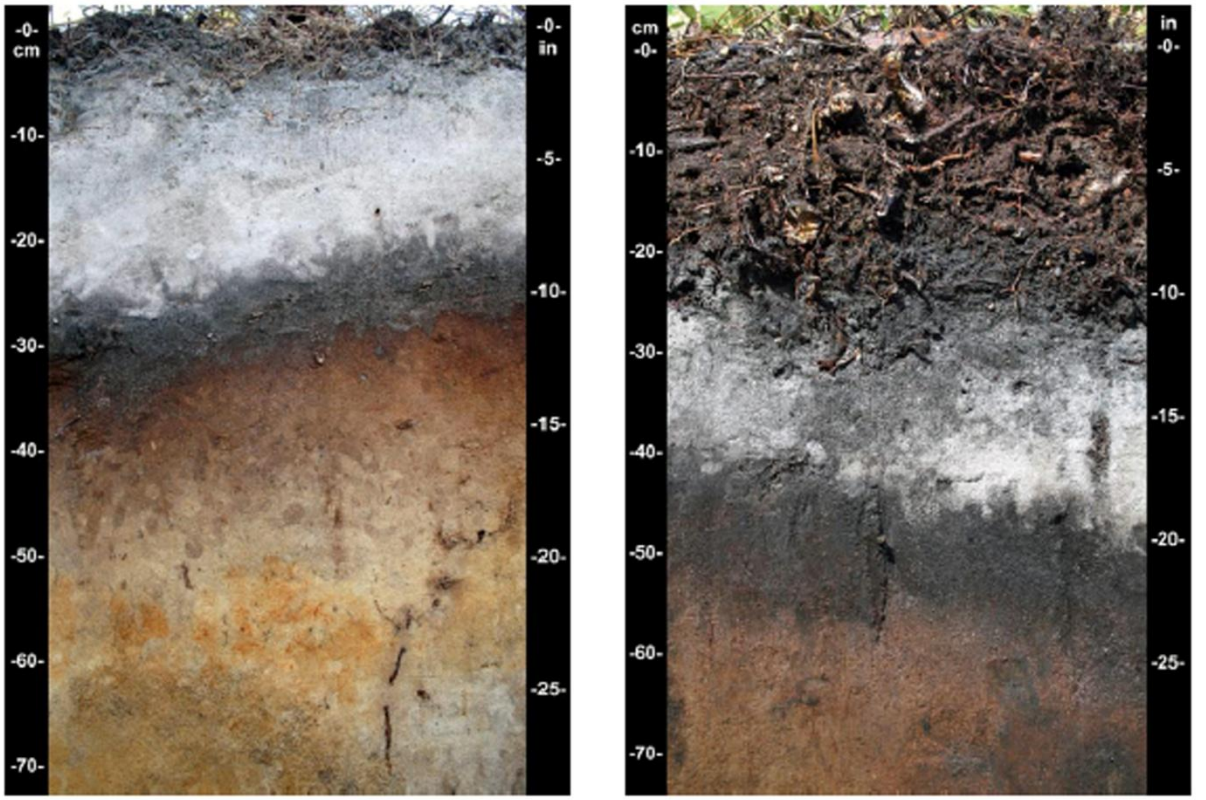
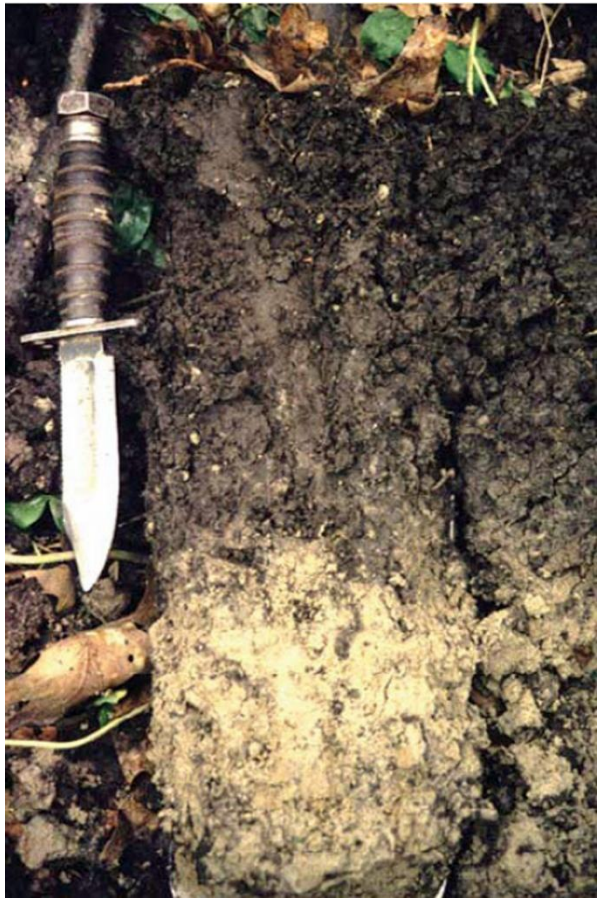


Figure 1.—The soil on the right is hydric. It meets the requirements of indicator S7 (Dark Surface). From the surface and to a depth of 10 cm, value is 3 or less and chroma is 1 or less. Below 10 cm, the matrix has chroma of 2 or less. The soil on the left is not hydric. It does not have a dark surface horizon thick enough to meet the requirements of indicator S7 and does not meet the requirements of any other indicator.

Use of Science (Cont'd.)

The field indicators are to be used to delineate hydric soils. The soil on the right is hydric; the Indicator S6 (Stripped Matrix) starts at a depth of about 14 cm. The soil on the left is nonhydric.



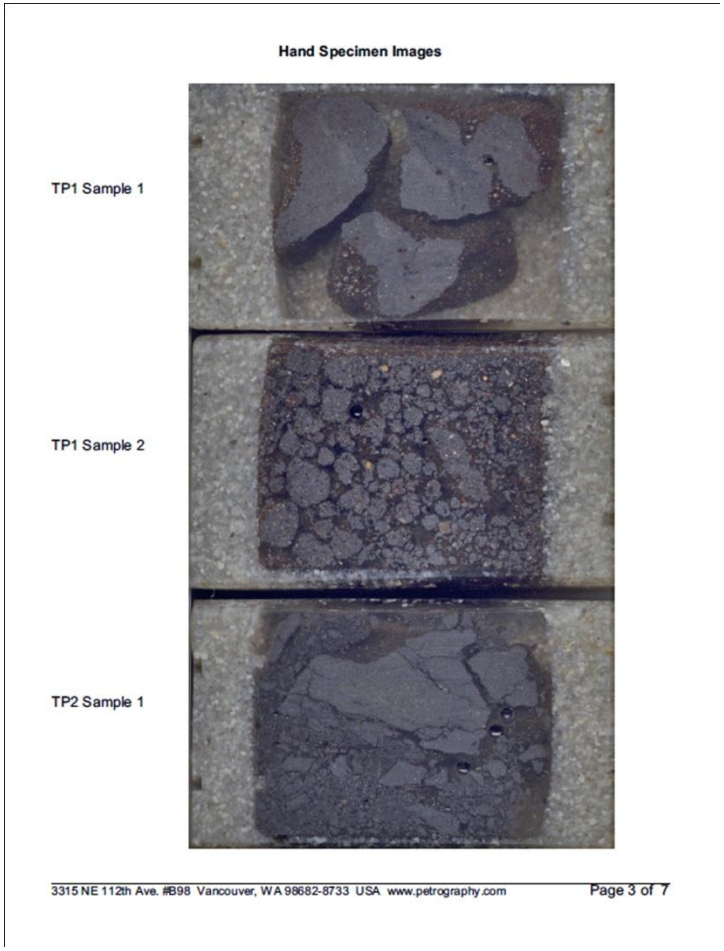
Indicator A11 (Depleted Below Dark Surface). This indicator is similar to F3 (Depleted Matrix). Because darker colored surface horizons imply more wetness, A11 indicates hydric conditions if the depleted matrix occurs within 30 cm of the soil surface, whereas F3 indicates hydric conditions if the depleted matrix occurs within 25 cm of the soil surface.

Use of Science (Cont'd.)

A soil that does not meet the requirements for Indicator S6 (Stripped Matrix) because the splotches are distinct rather than diffuse.

Properly Identifying Soils is Complex

Soils from the Auburn Valley area – Lahar deposits overlying the Osceola mudflow. These samples are as much as 100% basalt, which naturally has a Munsell® Color (dry) of 10YR 2/1. These soils are unaltered, and there is no evidence of any reduction or that these soils have been saturated long enough to develop wetland conditions (unaltered means there is no formation of any hydric soils characteristics). However, the Corps has previously determined that these are hydric soils based on desktop routine studies.

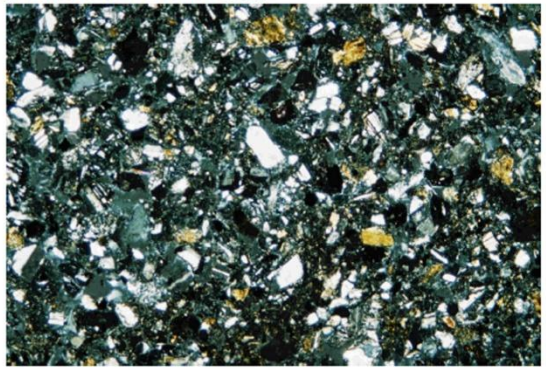


Photomicrographs of Soils

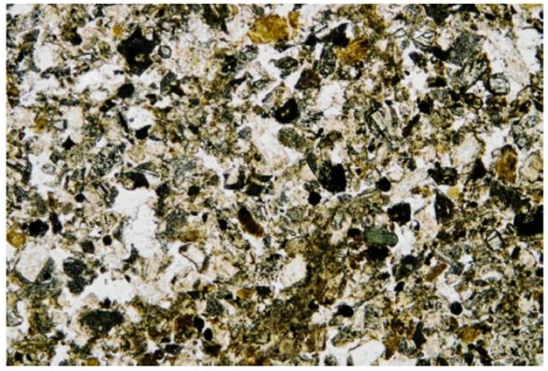
These are the same lahar soils under high magnification, that show the high concentration of pure basalt and sharp crystal contacts, with no evidence of any alteration of the minerals, which wetland scientists have determined to be “hydric soils” (and without stating their type) based on color alone. Scientific studies, however, indicate that these are not hydric soils of any kind.

IMAGES

TP1 Sample 2 10014_07.jpg/XPL/FOV = 1.85 x 2.69 mm/YUH BASALTIC SANDSTONE showing typical appearance (same view as 10014_08.jpg).



TP1 Sample 2 10014_08.jpg/PPL/FOV = 1.85 x 2.69 mm/YUH BASALTIC SANDSTONE showing typical appearance (same view as 10014_07.jpg).



Use of Science - Wetlands (Cont.)

- Vegetation studies can be conducted by ANYONE (there are no State requirements), but preferably would be conducted by a biologist, a highly qualified and experienced wetland scientist, or other trained professional with the required years of experience. A degree in biology or a related science is usually required; however, since the Corps purposely biases the vegetation to include non-hydrophytes as hydrophytes, and does not require the delineator to demonstrate that the vegetation has adapted to thrive in saturated, anaerobic, reducing soils – these studies could be conducted by *anyone* – and in some places they are (i.e., Island County residents can conduct their own wetland studies and make their own wetland delineation and ratings). Since no science is required (because all vegetation found in the Puget Lowlands except FACU is considered to be "hydrophytes"), making this determination worthless for wetland identification purposes. (The vegetation indicator status is not based on any region-specific studies that include physiological adaptation identification and actual testing to determine tolerance to wetland hydrology, which is saturated soil conditions, and if hydric soils must be present, the soil will be anaerobic and reducing).
- Soil studies can be conducted by a soils scientist; however, for many applications, a licensed geologist is typically required since the State of Washington began requiring licenses for the practice of geology (since 2002). Studies conducted by non-geologists/soil scientists are often misinterpreted. A minimum of a BS in Geology or Soil Science is usually required.

Use of Science (Cont.)

- Hydrology/Hydrogeology studies can be conducted by a licensed hydrologic engineer, but due to the required ground water studies, are best suited for licensed hydrogeologists. Studies conducted by non-licensed professionals often result in misinterpreted hydrology/hydrogeology. A minimum of a BS in Geology or Hydrologic Engineering is usually required. However, for a licensed hydrogeologist, a degree in the geologic sciences (BS minimum), an EIT (test), five years of practice in geological sciences under a licensed geologist, and passing the national exam are required to obtain a license as a geologist. To become a licensed hydrogeologist, an additional 10 years of experience practicing in hydrogeology and passing a state/national exam is required before the obtaining this license.
- Since 2/3 of the wetland studies fall within the geologic sciences, these studies should be presented in a report that meets the requirements of the State of Washington Geologists Licensing Board, and should incorporate the requirements of the Manual. However, there are currently no report formats that are specifically required by the regulations, unless the studies are conducted by a licensed geologist or hydrogeologist. Technically, under state licensing laws, all wetland studies should be conducted by or under the direct supervision of a licensed geologist (at a minimum), with the wetland hydrology studies being conducted by or under the direct supervision of a licensed hydrogeologist.

Use of Science (Cont.)

- Streams
  - Streams should only be identified by licensed hydrologists, licensed geologists with fluvial geomorphology experience, or licensed hydrogeologists.
  - Stream typing can be conducted by most biologists and other professionals who have the appropriate training and experience; after these water bodies have been identified as actual regulatory streams by geologists.
  - Washington State's Puget Lowlands are unique due to recurring continental glacial advances and retreats over the last 80,000 years, with the last event being the Vashon Stade and Everson *glaciomarine* drift – especially in northern portions of Puget Sound including the San Juan Islands and Whidbey Island. It should be noted that all soils in the Puget Lowlands are young due to the Vashon Stade glacial advance, and retreat (approximately 18,000 – 11,000 years BP.

Note: As discussed in this course, there are no definitions for a stream in State or Federal regulations, including WAC 222.16.030. However, there are exemptions for "non" streams (storm water ditches, etc.) in State law (the GMA and SMA). Some municipalities include definitions for streams in their critical areas ordinances and in their storm water regulations – the Kitsap County Code definitions are typical, and generally refer to fluvial geomorphologic features that must be present, and state that the channelized water body must be "naturally occurring".

SNR Proposed Stream Definition

- Because there is no State definition for a stream (or Federal definition), and the definition varies widely among municipalities (although many generally have the same description as Kitsap County has), SNR developed a peer-reviewed definition that meets Best Available Science criteria, and is seeking a legislative sponsor to have this definition adopted by the State of Washington:

- **SNR's PROPOSED DEFINITION FOR A STREAM:**
  - **Definition of Stream:**
    - "Stream" – A naturally-occurring geologic feature, that is a body of periodically ("seasonal" or "intermittent") or continuously-flowing ("perennial") water in a naturally-formed channel where: natural head water provides the primary stream flow and ground water provides the base flow and the stream channel exhibits the fluvial geomorphologic characteristics of a natural stream.
    - A stream is created by natural headwater – surface water flows that are sufficient to produce a defined channel or bed, and are sustained by natural ground water base flow. A stream must have a defined channel or bed that conforms to the natural geomorphology of the area, demonstrate clear evidence of the passage of water, and have natural fluvial geomorphologic features that include, but are not limited to, bedrock channels, gravel beds, sand and silt beds, sinuosity greater than 1.5, and defined-channel swales. The channel or bed must be either perennial (flowing year-round), or seasonal (intermittent: flowing during the rainy season and as long into the dry season as the ground water base flow allows).
    - This definition is not meant to include irrigation ditches, canals, storm or surfacewater runoff devices, agricultural drainage ditches, stormwater facilities regulated by the Clean Water Act per 16 U.S.C. § 1531 et seq., or other artificial watercourses, even if fish are present. Rivers have the characteristics of large streams, with a base mean flow of at least 20 cubic feet per second, and are considered to be shorelines of the State.

Use of Science (Cont.)

- Stream typing in Washington State has evolved from interim typing of streams as “classes” to typing of streams as “types”.
- The GMA recommends the use of WAC 222-16-030 typing methods to meet Best Available Science requirements.
- WAC 222-16-30 recognizes 4 stream types:
  - **Type S** - all waters, within their bankfull width, inventoried as "shorelines of the state" under chapter 90.58 RCW and the rules promulgated pursuant to chapter 90.58 RCW including periodically inundated areas of their associated wetlands
  - **Type F** - segments of natural waters other than Type S Waters, which are within the bankfull widths of defined channels and periodically inundated areas of their associated wetlands, or within lakes, ponds, or impoundments having a surface area of 0.5 acre or greater at seasonal low water and which in any case contain fish habitat or are described by one of four categories.
  - **Type Np** - all segments of natural waters within the bankfull width of defined channels that are perennial nonfish habitat streams. Perennial streams are flowing waters that do not go dry any time of a year of normal rainfall and include the intermittent dry portions of the perennial channel below the uppermost point of perennial flow.
  - **Type Ns** - all segments of natural waters within the bankfull width of the defined channels that are not Type S, F, or Np Waters. These are seasonal, nonfish habitat streams in which surface flow is not present for at least some portion of a year of normal rainfall and are not located downstream from any stream reach that is a Type Np Water. Ns Waters must be physically connected by an above-ground channel system to Type S, F, or Np Waters.

Note: WAC 222-16-030 does not list BAS references for Puget Lowland streams, nor does it even provide a definition for the regulated streams. It should be noted that if the channelized water body is a point source storm water conveyance, it is not a stream, and allowing endangered species to enter this conveyance could constitute a Taking under the ESA.

Streams (Cont.)

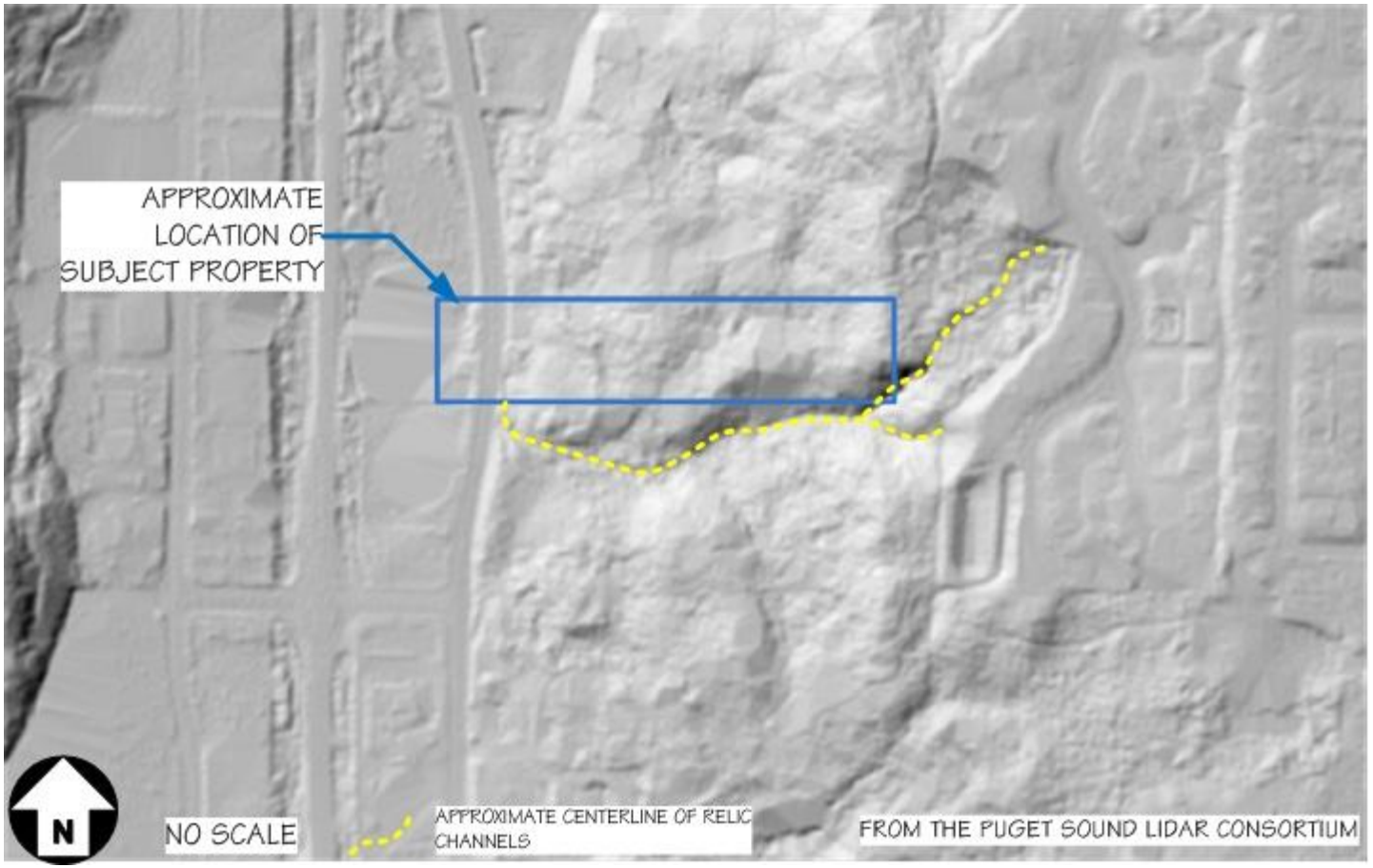
- There are thousands of relict glacial meltwater streams, especially on the flanks of ridges and plateaus that are above river valleys.
- These relict streams are very commonly used as storm water conveyances by municipalities, but are actually storm water conveyances – not streams.
- In the Puget Lowlands there are two types of regulated streams - perennial and intermittent (seasonal), and both require ground water. Ephemeral drainage channels (ephemeral streams) are not considered to be regulatory streams because they do not support aquatic wildlife.
  - Ephemeral streams are not considered to be regulatory streams. These drainage features do not have ground water base flows, and only flow when there is sufficient precipitation. per the U.S. Supreme Court decision (Rapanos v United States, 2006), ephemeral drainage features are not regulatory streams.

Relic Glacial Meltwater Streams

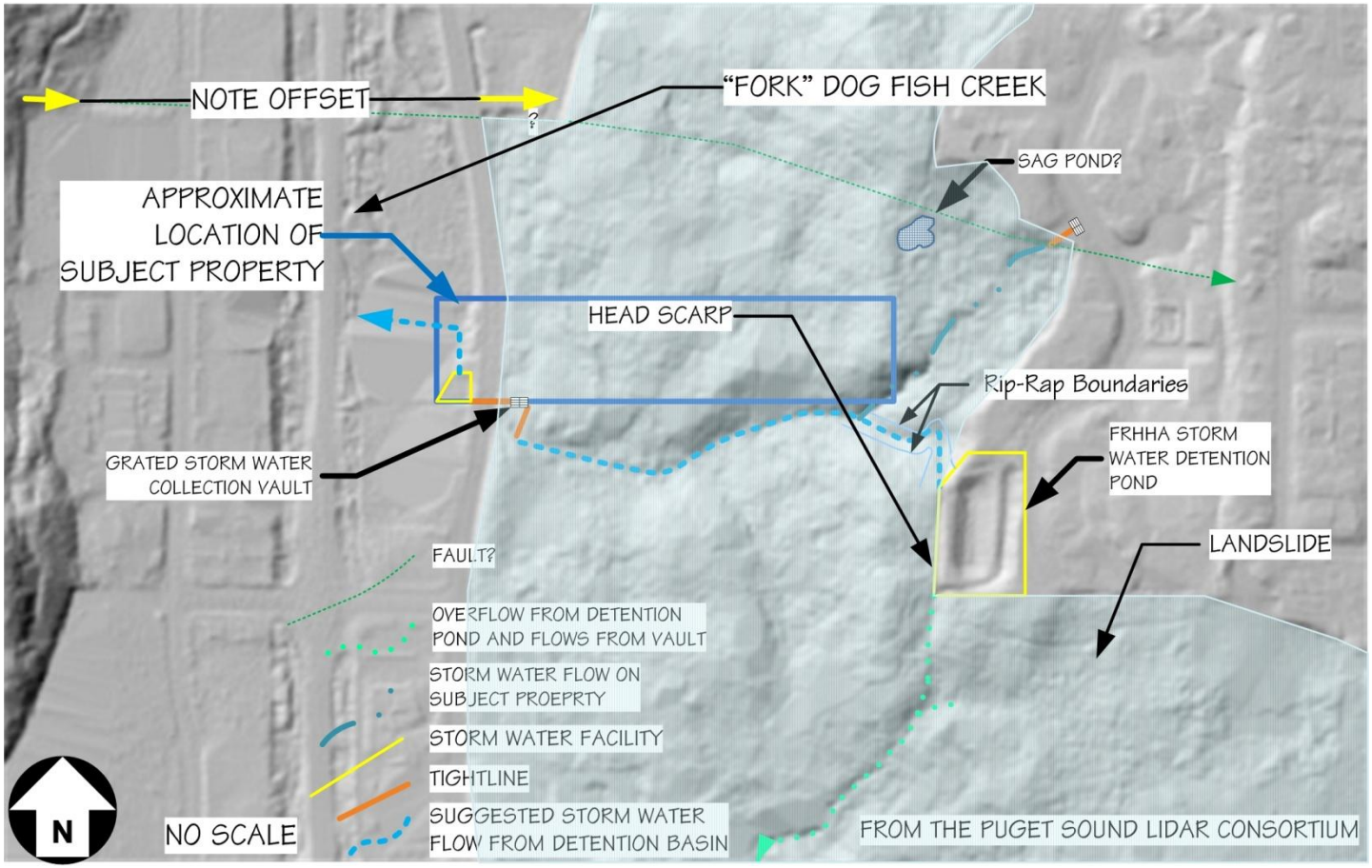
Notice anything unusual? Evidence of streams, geologic hazards, or any other critical areas?

Relict Glacial Meltwater Streams (Cont.)

The City of Poulsbo and the WDFW claim that a natural, Type N Stream is present next to the subject property. Do you notice anything unusual?



Relict Glacial Meltwater Streams and Geologic Hazards (Cont.)



Notice anything now? How about the natural N Type Stream and the Placement of a Major Storm Water Infiltration Facility? How about the landslide and MAJOR recent fault?

Relict Glacial Meltwater Channels (Cont.)

- The WDFW, a professional wetland scientist (PWS), and even an engineering firm (Alki), all missed the landslide, missed the source of the "stream flow", missed the active landslides on the property caused by the "stream flow", and missed that two major storm water facilities, including an infiltration facility, were constructed on a landslide scarp. They also missed the hydrology (there is an artesian well on this property) and the MAJOR recent fault that most likely triggered the landslide.
- Not only is the City-"identified" Type N stream, not a stream, it is a MS4 storm water conveyance, and is creating and worsening major geologic hazards. The storm water facilities should NEVER have been permitted, and there should have been severe restrictions placed on any development in this area. However, SNR's principal hydrogeologist/engineering geologist was the first qualified, licensed geologist to finally study this site. In this case, the City allowed storm water to be discharged to a relict meltwater channel that was created by a fault-triggered landslide, resulting in more geologic hazards, and the WDFW (which does not have geologists or any licensed personnel) and the City planner (who is also not licensed) insist that this is a natural stream and have completely ignored the major problems associated with this site, which is destined to fail and is a major threat to human life and to the environment.

Use of Science (Cont.)

- Some municipalities and counties use their own stream classification methods, which are different from the Forest Practices Board's methods in WAC 222-16-030.
- Setbacks and buffers for streams generally vary even for the same types of streams, depending on the specific county or municipal critical areas code.
- Technically, Type S streams cannot be considered to be critical areas streams because of recent changes to the Shoreline Management Act (this was due to a recent Washington State Supreme Court decision (July 31, 2008 - *Futurewise v. Western Washington Growth Management Hearings Board)* because these streams are covered under the State's Shoreline Management Act. However, under the new SMA provisions, the same types of areas and geologic hazards that are identified by the GMA must be addressed in the SMP's, with equal restrictions. One of the primary differences, however, is that the SMA establishes no net loss of "existing" habitat functions. It also apparently (depending on who you talk to) converts all development on shoreline property to conforming use (only residential properties and those who have already had some development conducted on them) even if this is only a road or a bulkhead. It is not clear whether or not these provisions are being observed by municipalities.
- WAC 222-16-030, however, **is not BAS**, and ignores the provisions of Section 402 (and Section 401) of the CWA. It also ignores the first step in a stream classification process, determining if the channelized water body is a stream or not, and there are no provisions in this section of WAC to identify what type of water body is being studied (i.e., no guidance for identifying streams compared to storm water conveyances, irrigation ditch's, and other exempt water bodies - especially CWA point source conveyances).

Use of Science (Cont.)

- Since WAC 222-16-030 does not include methods for identifying streams, nor do any other State, Federal, or Municipal environmental or ecological guidance documents SNR has reviewed; SNR must use the definition for streams included in the Critical Areas ordinances; however, none of these definitions can be traced to a Best Available Science source.
- The most common definition for a stream (although these vary somewhat) is:
  - ***"Critical Areas Streams"*** *– are those areas in Kitsap County where the surface water flows are sufficient to produce a defined channel or bed. A defined channel or bed is an area which demonstrates clear evidence of the passage of water and includes, but is not limited to, bedrock channels, gravel beds, sand and silt beds and defined-channel swales. The channel or bed need not contain water year-round. This definition is not meant to include irrigation ditches, canals, storm or surface water runoff devices, or other artificial watercourses unless they are used by fish or used to convey streams naturally-occurring prior to construction.*
  - **22.12.010 Definitions;** 84. "Stream" means a naturally occurring body of periodically or continuously flowing water where: (a) the mean annual flow is greater than 20 cubic feet per second; and (b) the water is contained within a channel.
  - **12.08.010 Definitions;** 71. "Storm water facility" means a component of a manmade drainage feature (or features) designed or constructed to perform a particular function or multiple functions including, but not limited to, pipes, swales, bioretention facilities, ditches, culverts, street gutters, detention basins, retention basins, wetponds, constructed wetlands, infiltration devices, catch basins, oil/water separators, and sediment basins. Storm water facilities shall not include building gutters, downspouts, and drains serving one single-family residence.

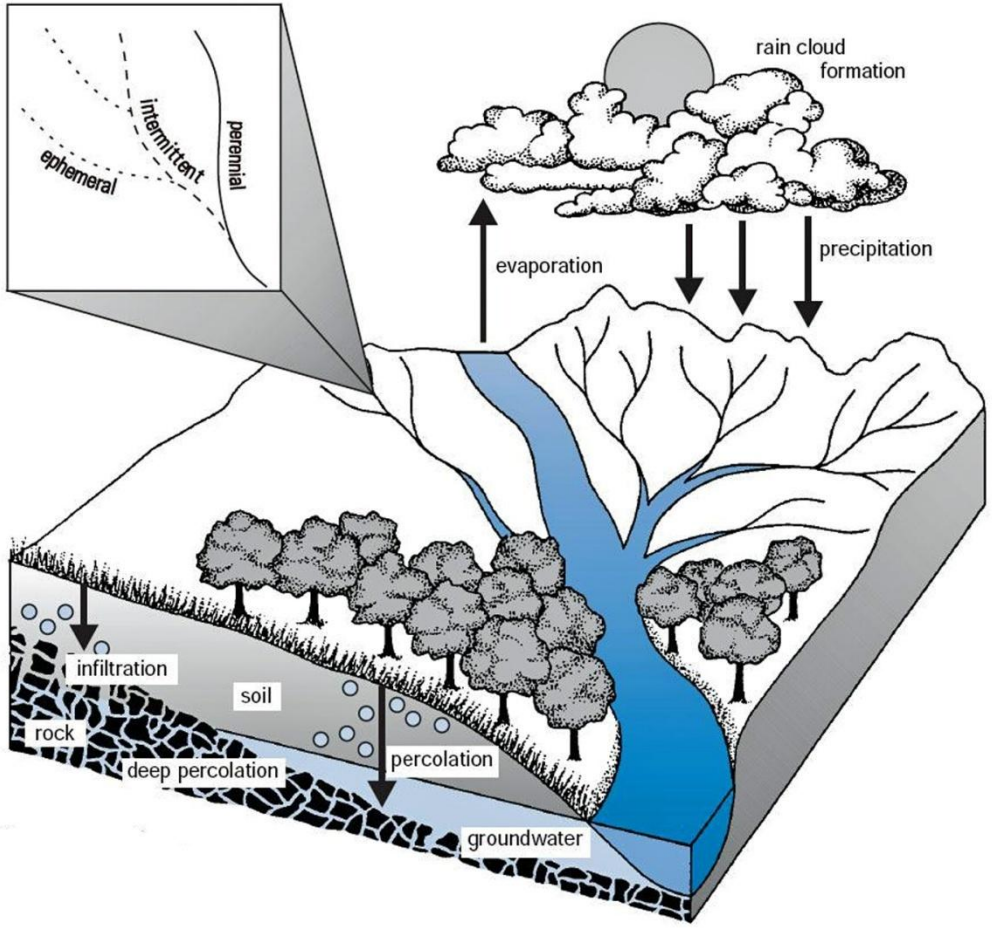
Use of Science (Cont.)

- Although Kitsap County's definitions vary somewhat from other municipalities, most use similar definitions, which are "fluvial geomorphologic" definitions – which is why SNR uses fluvial geomorphology and other methods to determine if a channelized water body is a stream. Also, in Kitsap County the "stream" must be naturally-occurring. Additionally, Kitsap County includes some key words that can lead to violations of the ESA (this can expose the County to Citizen's Lawsuits), because they use the presence of fish as part of the determination. However, a point source MS4 conveyance or other point source stormwater (or agricultural drainage) ditches are considered to be polluted, and will cause harm to fish if they are allowed into these point source systems (especially if they are regulated as 'streams' exclusively due to the presences of fish). It is inferred that this will cause harm to these fish; polluted waters can have low dissolved oxygen, high biological oxygen demand, high temperatures, and are generally ephemeral, which leads to stranding if the fish do not die of lack of oxygen, exposure to pollutants, or high temperatures. This would be considered an unauthorized taking, and is very good grounds for citizens to sue the County for violations of the ESA (and State laws) that include the Citizen's Lawsuit provisions. A copy of a guide to Citizens' Lawsuits is on the DVD included in your course folder.
- It should be noted that King County has purposely not defined what a stream is, and that during the creation of their sensitive areas ordinance, the County cataloged all channelized water bodies as streams and all ponds and flood-prone areas (including farm ponds, drainage ditches, irrigation ditches, artificial duck ponds, and manmade depressions) as wetland areas. These are actually commonly being used as storm water detention facilities by the County). This means that in many areas, King County has no MS4 infrastructure - as required by their own Code (Title 9); their King County Surface Water Design Manual, 2009; or their Phase I Municipal Storm Water NPDES permit. This makes King County very vulnerable to citizens lawsuits under the CWA (for permit violations and for ESA violations).

Use of Science - Streams (Cont.)

- Per fluvial geomophological requirements, and other hydrologic requirements, all streams must have natural head water(s), which is a source of the surface water that creates the stream channel.
  - Ephemeral streams are not considered to be regulated streams because they only flow when the watershed receives enough precipitation to create surface water flows; they are always above the ground water table. These are not considered to be typable as streams under Critical Areas ordinances, and are considered non-streams in the Rapanos decision (United States Supreme Court plurality decision). They are often found in relict glacial meltwater channels, usually because MS4 or other storm sewer systems have been designed to discharge into them (often without the installation of erosion and sediment control BMP systems and without detention facilities to decelerate the surface water flows), which can cause flooding and significant erosion on valley floors. Many municipalities define these as streams, even though they are actually MS4 or Section 401 storm water facilities.
  - Seasonal streams (AKA intermittent streams) receive surface water from precipitation, and also receive ground water when the potentiometric surface of the ground water is high enough – usually during the wet season. These streams are frequently dry during the dry season, although they are typable as critical areas streams. These streams do have head water and have the typical fluvial geomorphologic features of streams.
  - Perennial streams must have a natural headwater source year -round. In the Puget Lowlands, this typically means that the headwater source is a spring. In the foothills and mountain areas this can be from snowpack. All perennial streams are typable as Critical Areas Streams.

Use of Science, Streams (Cont.)

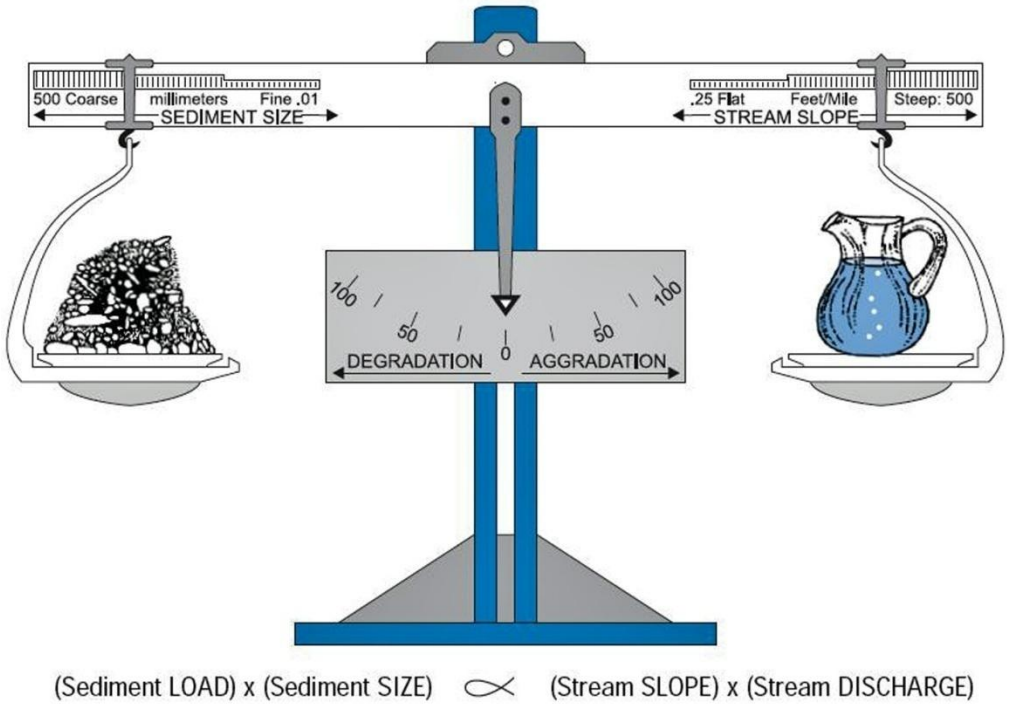


Use of Science (Cont.)

- While streams and rivers vary greatly in size, shape, slope, and bed materials, all streams share common characteristics. Streams have left and right stream banks (looking downstream) and streambeds consisting of mixtures of bedrock, boulders, cobble, gravel, sand, or silt/clay.
- Other physical characteristics shared by some stream types include pools, riffles, steps, point bars, meanders, flood plains, and terraces. All of these characteristics are related to the interactions among climate, geology, topography, vegetation and land use of the watershed. Each of these characteristics is defined in most fluvial geomorphology textbooks (some of these are described in the course material.) The study of these interactions and the resulting streams and rivers is called **fluvial geomorphology**.

Use of Science Streams (Cont'd.)

Sediment transport is a factor of the amount of flow in a stream. In the valley floors, streams usually meander due to the low topographic gradient, and under normal conditions are depositional streams and rivers.

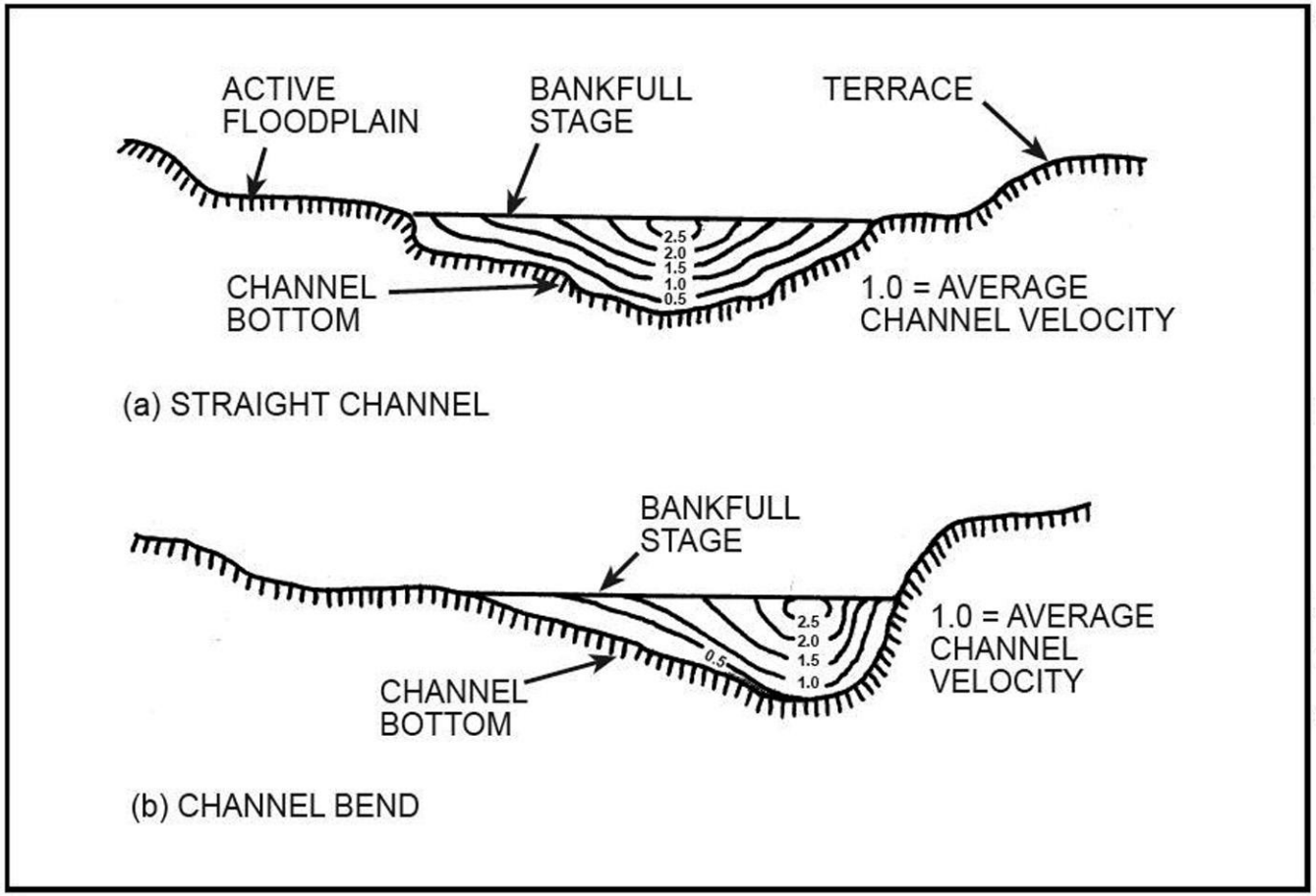


Sediment transport is usually attained when a bankfull width of water is present. This means the stream or river channel is completely full from the top of bank. These flows are necessary to maintain stream stability and to prevent the development of braided reaches.

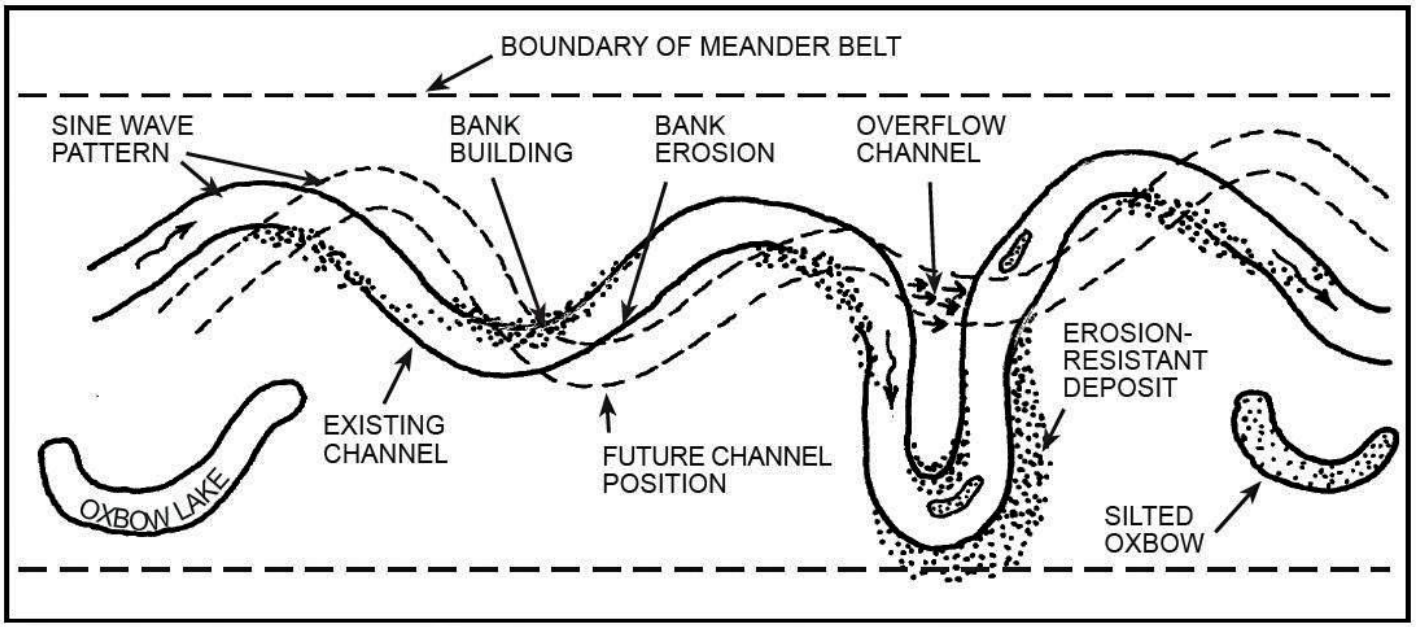
Use of Science Streams (Cont'd.)

- The most important stream process in defining channel form is the **bankfull discharge,** which is sometimes referred to as the effective discharge, or dominant discharge. Bankfull discharge is the flow that transports the majority of a stream's sediment load over time and thereby forms the channel. The bankfull stage, during bankfull flow, is the point just below a flooding event. If the flow exceeds the bankfull discharge, overbanking will occur (creating natural levees) and river or stream waters will enter the floodplain. This is a flood event, and it leads to different types of floodplain deposition, with the coarser materials (gravels and medium-to-coarse sands) being deposited closest to the channel, and the finer materials (silts and clays) being deposited furthest from the channel.
- If the stream has downcut due to changes in the watershed or streamside vegetation, the floodplain stage may be a small bench or scour line on the stream bank. In this case, the top of the bank, which was formerly the floodplain, is called a **terrace.** A stream with terraces close to the top of the banks is an **incised** or **entrenched stream.** If the stream is not entrenched, then the bankfull discharge occurs near the top of the bank. On average, bankfull discharge occurs approximately every 1.5 years. In other words, each year there is about a 67 percent chance of having a bankfull streamflow event.

Use of Science Streams (Cont'd.)



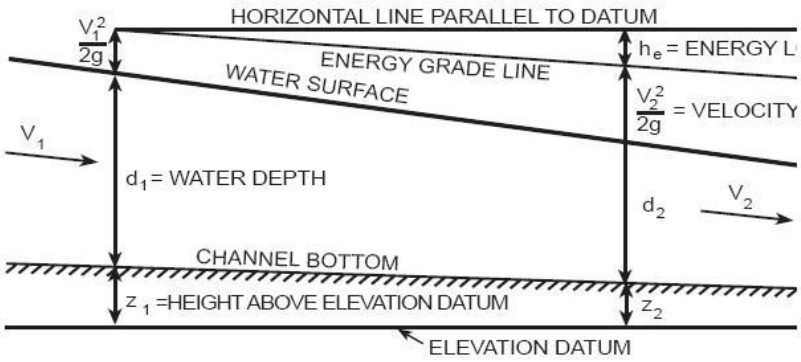
Use of Science Streams (Cont.)



Use of Science. Streams (Cont.)

- The Rosgen stream classification system uses "bankfull stage" as the basis for measuring the **width/depth ratio and entrenchment ratio** – two of the most important delineative criteria.
- A naturally stable stream channel maintains its dimension, pattern, and profile over time so that the stream does not **degrade** or **aggrade. Stable streams** migrate across the landscape slowly over long periods of time, while maintaining their form and function. Naturally stable streams must be able to transport the sediment load supplied by the watershed.
- Instability occurs when scouring causes the channel to incise (degrade), or excessive deposition causes the channel bed to rise (aggrade). A generalized relationship of stream stability is shown as a schematic drawing (on the next slide). The drawing shows that the product of sediment load and sediment size is proportional to the product of stream slope and discharge or stream power. A change in any one of these variables causes a rapid physical adjustment in the stream channel.
- The **dimension of a stream** is its cross-sectional area (width multiplied by mean depth). The width of a stream generally increases in the downstream direction in proportion to the square root of discharge. Stream width is a function of discharge (occurrence and magnitude), sediment transport (size and type), and the stream bed and bank materials.
- **Stream pattern** describes the **"plan view"** of a channel as seen from above. **Streams are rarely straight.** They tend to follow a sinuous path across a floodplain. The sinuosity of a stream is defined as - the channel length following the deepest point in the channel (the thalweg) divided by the valley length. A meander increases resistance and reduces channel gradient relative to a straight reach. The meander geometry and spacing of riffles and pools adjust so that the stream performs minimal work.

Use of Science (Cont.)



Continuity Equation

$Q = (V)(A)$

where: Q = discharge; V = velocity; A = cross-sectional area of channel

Energy Equation

$$\frac{V_1^2}{2g} + d_1 + z_1 = \frac{V_2^2}{2g} + d_2 + z_2 + h_e$$

where: g = gravity constant

h_e = energy losses (friction losses + expansion and contraction losses)

z = elevation head

Manning's Equation

$Q = (1.5/n)(A)(R^{2/3})(S^{1/2})$ and $R = A/P$

where: n = Manning's roughness coefficient, R = hydraulic radius

P = wetted perimeter, and S = friction slope

Energy Dissipation

$$h_e = (S)(L) + C\left|\frac{V_1^2}{2g} - \frac{V_2^2}{2g}\right|$$

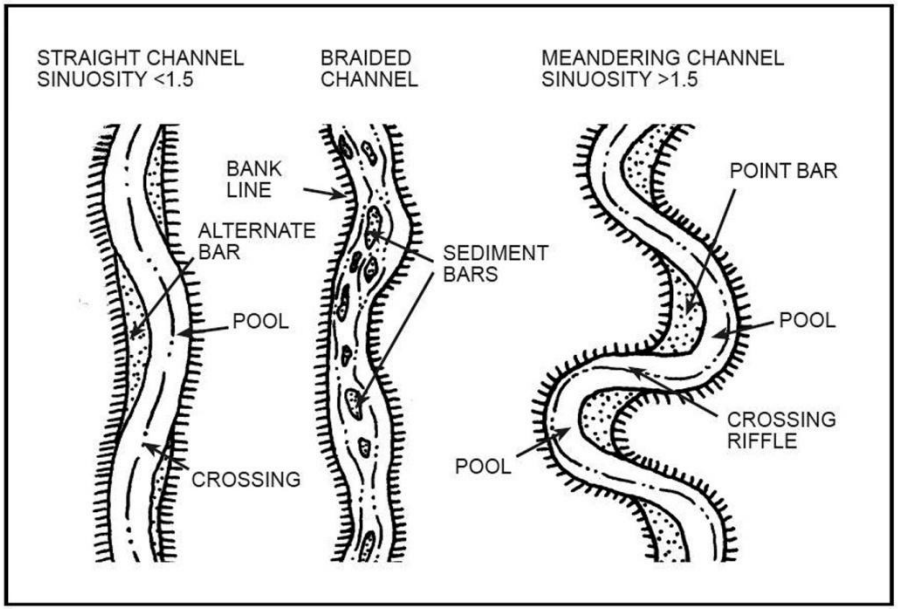
where L = reach length

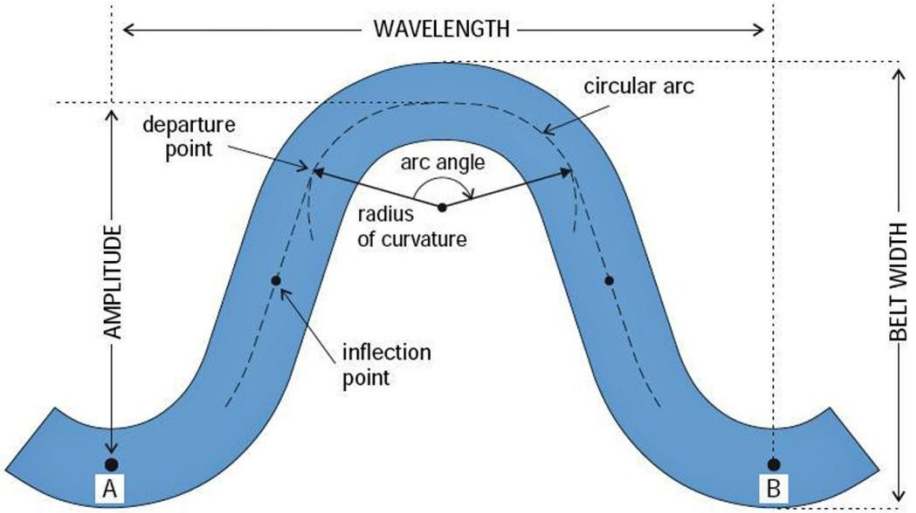
and C = coefficient of expansion or contraction

Use of Science, Streams (Cont.)

- Stream pattern is qualitatively described as straight, meandering, or braided. Braided channels are less sinuous than meandering streams and possess three or more channels.
- Quantitatively, stream pattern can be defined through the following measurements: meander wavelength, radius of curvature, amplitude, and belt width.
- The **profile of a stream refers to its** longitudinal slope. At the watershed scale, channel slope generally decreases in the downstream direction. The size of the bed material also decreases in the downstream direction. Channel slope is inversely related to sinuosity. This means that steep streams have low sinuosities and flat streams have high sinuosities. The profile of the stream bed can be irregular because of variations in bed material size and shape, riffle/pool spacing, and other variables. The water surface profile mimics the bed profile at low flows. As water rises in a channel during storms, the water surface profile becomes more uniform.

Use of Science, Streams (Cont.)

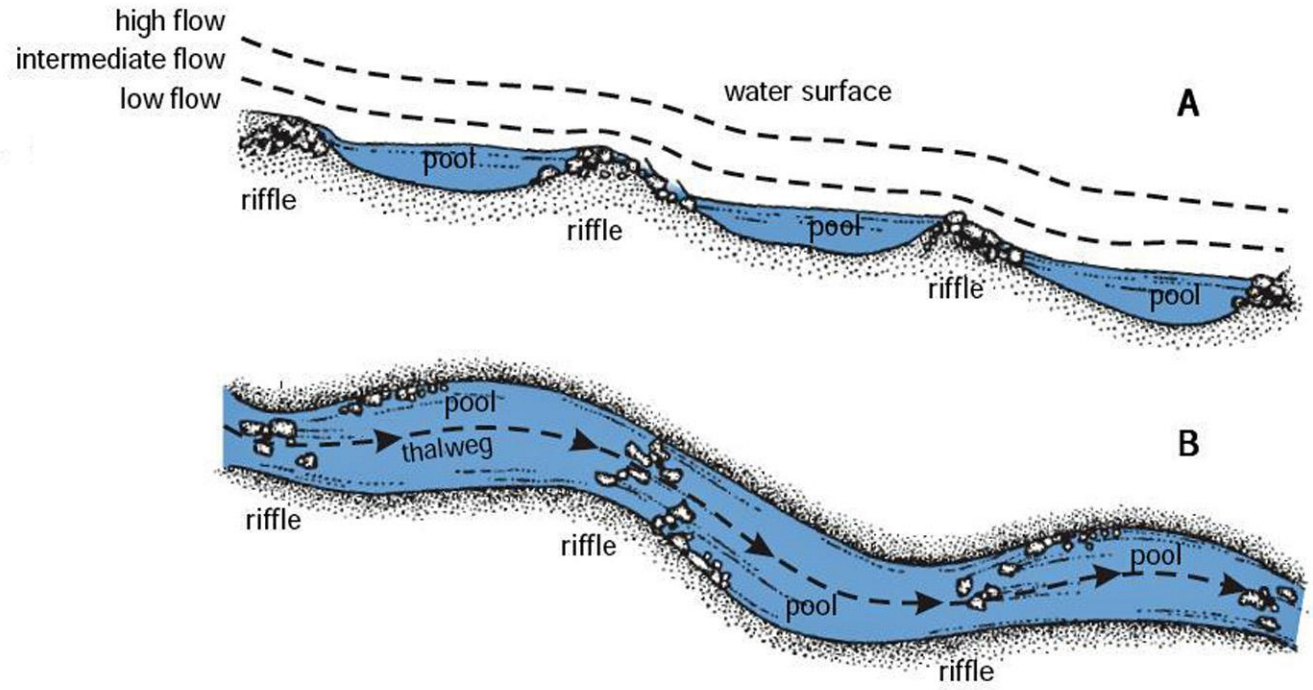




Use of Science, Streams (Cont.)

- Natural streams have sequences of riffles and pools or steps and pools that maintain channel slope and stability (these features are shown on the next slide). The riffle is a bed feature with gravel or larger-sized particles.
- The water depth is relatively shallow and the slope is steeper than the average slope of the channel. At low flows, water moves faster over riffles, which provides oxygen to the stream. Riffles are found entering and exiting meanders, and control the stream bed elevation.
- Pools are located on the outside bends of meanders, between riffles. The pool has a flat slope and is much deeper than the average depth. At low flows, pools are depositional features and riffles are scour features. At high flows, however, the pool scours, and bed material deposits on the riffle. This occurs because a force called **shear stress**, applied to the stream bed, increases with depth and slope. Slope and depth increase rapidly over the pools during large storms, increasing shear stress and causing scour. The inside of the meander bend is a depositional feature called a **point bar**, which also helps maintain channel form.

Use of Science, Streams (Cont.)



Use of Science, Streams (Cont.)

- Step/pool sequences are found in high gradient streams. Steps are vertical drops often formed by large boulders, bedrock knick points, downed trees, etc. Deep pools are found at the bottom of each step. The step provides grade control, and the pool dissipates energy. The spacing of step pools gets closer as the channel slope increases.
- A stream and its floodplain comprise a dynamic environment where the floodplain, channel, and bed forms evolve through natural processes that erode, transport, sort, and deposit alluvial materials. The result is a dynamic equilibrium, where the stream maintains its dimension, pattern, and profile over time, neither degrading nor aggrading.
- Streams that overbank (most natural streams) will create natural levees which will grade into the floodplain.
- All stream banks are formed by the water moving in the stream. **Natural stream banks are never vertical**, they are always narrower at the base of the channel than at the top of the bank, and the width of the channel is based on the bankfull width flows that occur during significant storm events.
- **Storm water conveyances are designed to be deeper and wider than a natural stream because it is usually undesirable to have overbanking occur where storm water conveyances are located**. Additionally, per the CWA, the water in these conveyances are considered to be point source polluted water, unfit for human consumption (and strictly unfit for any aquatic species to be introduced into) without being exposed to potentially lethal conditions, and **can lead to violations of the ESA**. This constitutes a DIFFERENT type of taking (unlike a property taking, such as inverse condemnation); it is a taking of an endangered species, which is unauthorized and has stiff penalties of $37,500 per day, per occurrence.
- It should be noted that land use changes in the watershed and channelization can upset the stream's hydrologic balance. A new equilibrium may eventually result, but not before large adjustments in channel form such as extreme bank erosion, channel movement, changes in the floodplain, or channel floor incision.

Use of Science - Ponds and Lakes

- Ponds and Lakes
  - The identification, classification, and hydrologic properties of a pond or a lake and the classification of this water body should only be conducted by licensed hydrologists or licensed geologists/hydrogeologists and limnologists.
  - The identification of habitats in a pond or a lake can be conducted by most biologists in the appropriate fields or by those who have the appropriate training and experience.
  - Ponds are regulated by the Growth Management Act, Lakes are regulated by the Shoreline Management Act.
  - There are several different types of ponds and lakes in the Puget Lowlands (and even more types in alpine regions). The most abundant type of ponds and lakes in the Puget Lowlands (by quantity, not size) are kettle ponds (less than 20 acres in size) and kettle lakes. These hydrologic features are unique, glacially-created water bodies and have very unique hydrology. Kettle ponds and pot holes are one of the most common sources for peat bogs, however, most of these have been mined for the peat for use in agriculture, civiculture, and horticulture. Some kettle pond peat bogs have been converted to private lakes such as Arrow Lake in Normandy Park.

Use of Science - Ponds and Lakes (Cont.)

- The hydrology of virtually all kettle ponds and kettle lakes is perched ground water, and most do not have inflowing streams or outflows because they are simply exposed ground water. However, during early settlement, these areas were clear cut and the understory was burned off to promote the growth of Douglas fir trees. This led to excess surface water flows, that raised the lake levels where mills were often located. To prevent the structures on the lake from being inundated (due to rising ground water levels and corresponding lake levels), outlets were constructed to drain the excess water. These drainage outlets now drain storm water that is diverted into virtually all of these lakes, using them as regional storm water detention facilities – a potential permit violation – and direct discharge of storm water into the lake can be considered to be a direct injection of storm water into the ground water, which requires an underground injection control (UIC) permit http://www.ecy.wa.gov/programs/wq/grndwtr/uic/index.html. Additionally, this can change the status of the pond or lake to that of a MS4 storm water detention facility, which is unique because the SMA does not address this (it addresses reservoirs, but not lakes that have been converted into detention wet ponds) partly because the SMA was enacted in 1972, and the Municipal Storm Water NPDES regulations were not enacted until 1987.

Use of Science - Ponds and Lakes (Cont.)

- Most Puget Lowlands naturally-occurring ponds and lakes are kettles, which are relict glacially-created features.
- Kettles are formed in recessional outwash deposits and are often associated with ice contact deposits, such as kame deposits.
- It is rare for kettles to have a natural stream confluence, and it is rare for kettles to be headwaters for streams.
- Kettle water elevations are usually exposed, perched ground water that accumulates in the kettle depression.

Ames Lake and Pothole, near Carnation, WA

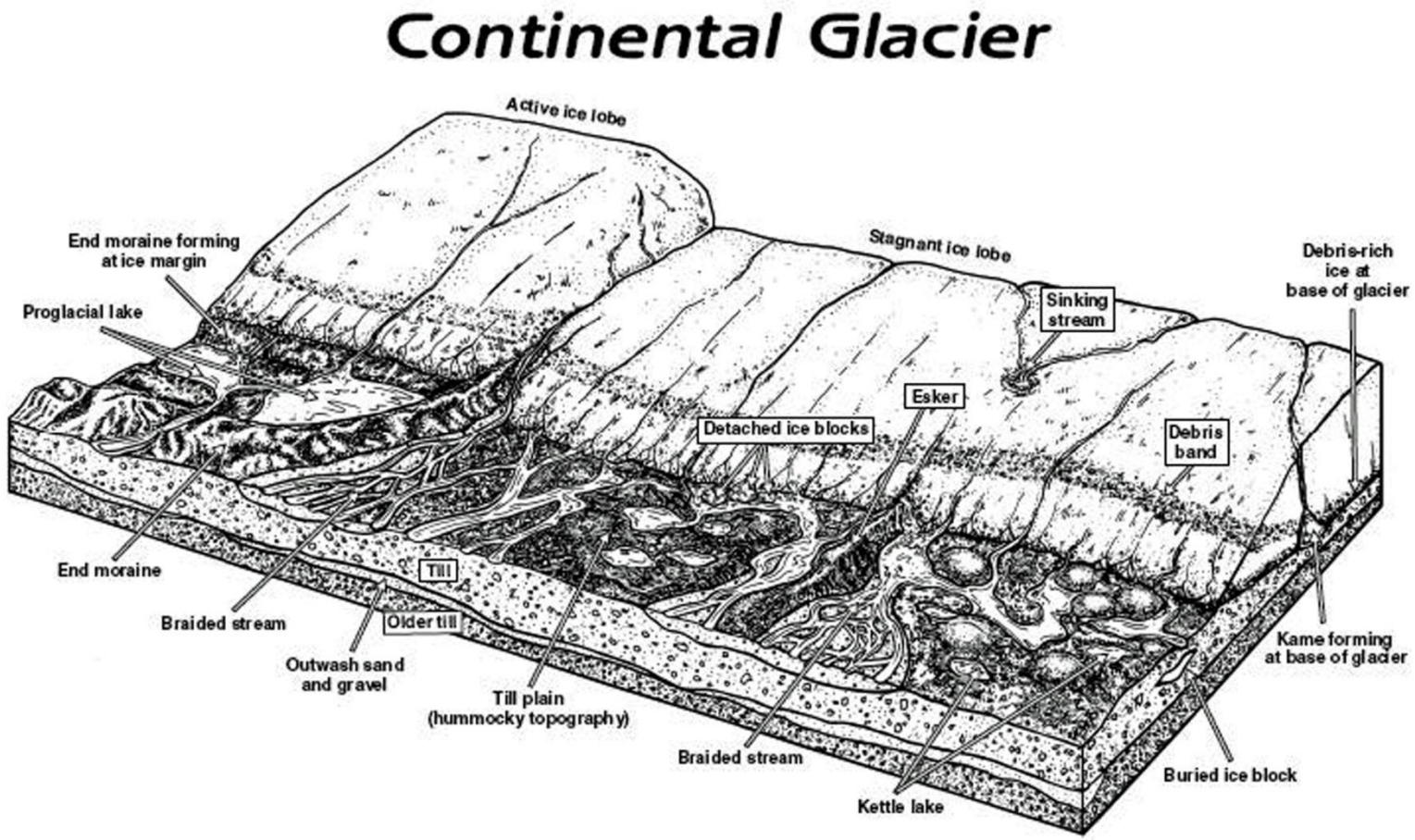
Use of Science (Cont.)

- Kettles are fluvioglacial landforms occurring as a result of blocks of ice calving from the front of a receding glacier and becoming buried partially (to wholly) by glacial outwash. Glacial outwash is generated when streams of meltwater flow away from the glacier and deposit sediment to form broad outwash plains called sandurs. When the ice blocks melt, kettle holes are left in the sandur. When the development of numerous kettle holes disrupt sandur surfaces, a jumbled array of ridges and mounds form, resembling kame and kettle topography.[1] Kettle holes can also occur in ridge-shaped deposits of loose rock fragments called till.[2]
- Kettle holes can also form as the result of floods caused by the sudden drainage of an ice-dammed lake. These floods, called Jokulhlaups, often rapidly deposit large quantities of sediment onto the sandur surface. The kettle holes are formed by the melting blocks of sediment-rich ice that were transported, and consequently buried, by the Jokulhlaups. It was found in field observations and laboratory simulations done by Maizels in 1992 that ramparts form around the edge of kettle holes that are generated by Jokulhlaups. The development of distinct types of ramparts depends on the concentration of rock fragments contained in the melted ice block, and on how deeply the block was buried by sediment.[3]

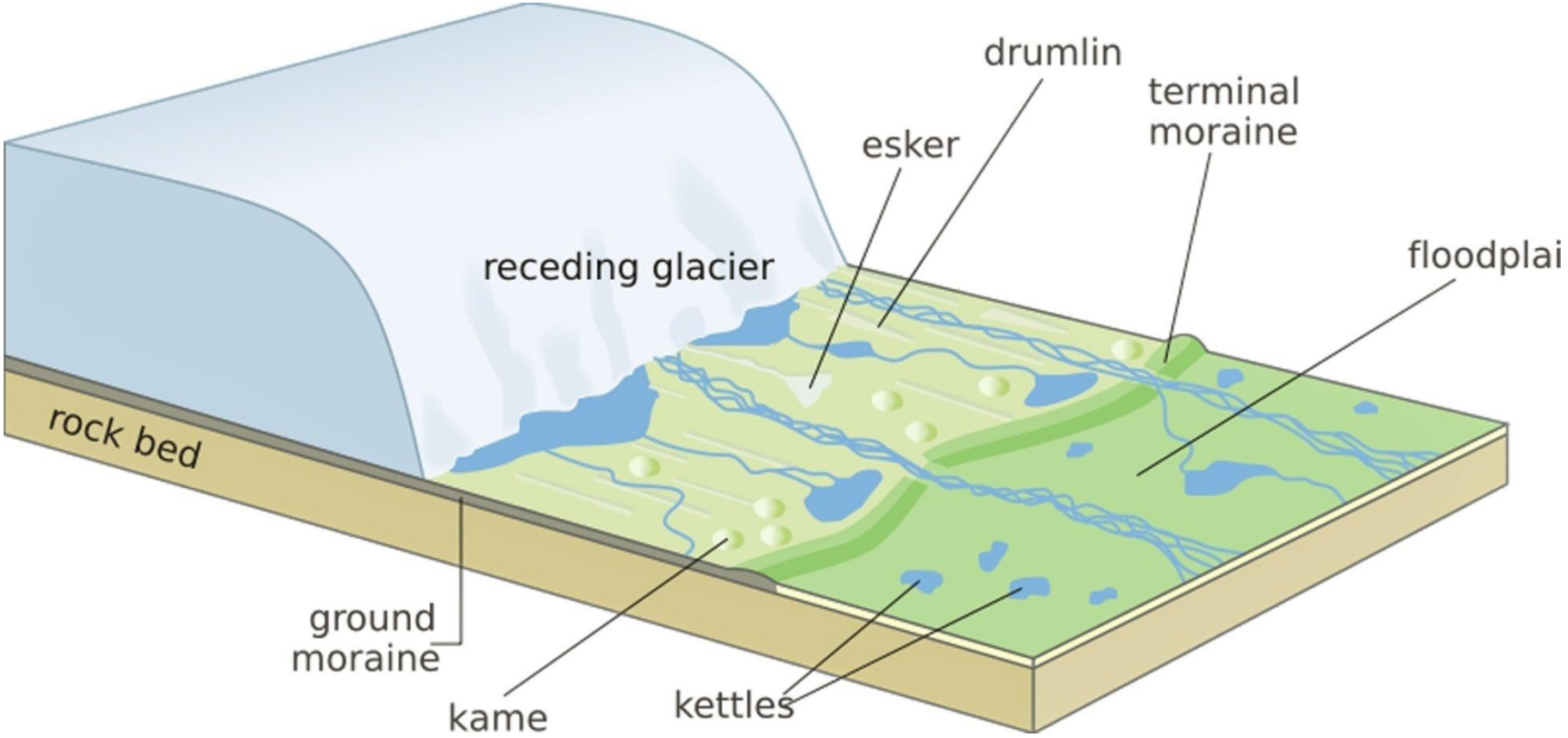
Use of Science (Cont.)

- Most kettle holes are no larger than 2 kilometers in diameter, although select kettles in the Midwest United States have exceeded 10 kilometers. Puslinch Lake in Ontario, Canada is the largest kettle lake in Canada, spanning 160 hectares (380 acres), and is a common recreational destination. Fish Lake, in the north central Cascade Mountains of Washington State is 200 hectares (~550 acres).
- In addition, the general depth of most kettles is less than 10 meters.[5] In most cases kettle holes eventually fill with water, sediment, or vegetation. If the kettle is fed by surface or underground rivers or streams it becomes a **kettle lake**. If the kettle receives its water from precipitation, the groundwater table, or a combination of the two, it is termed a kettle pond, or kettle wetland - if vegetated. Kettle ponds that are not affected by the groundwater table will usually become dry during the warm summer months (deemed ephemeral).
- If water in a kettle becomes acidic due to decomposing organic plant matter, it becomes a kettle bog or kettle peatland, if underlying soils are lime-based and neutralize the acidic conditions somewhat. Kettle bogs are closed ecosystems because they have no water source other than precipitation.
- Kettle lakes in the Puget Lowlands can be up to 85 feet deep and some are over 65 acres in size, and even bigger when they are interconnected complexes, such as the Beaver Lakes.

Use of Science (Cont.)



Use of Science (Cont.)

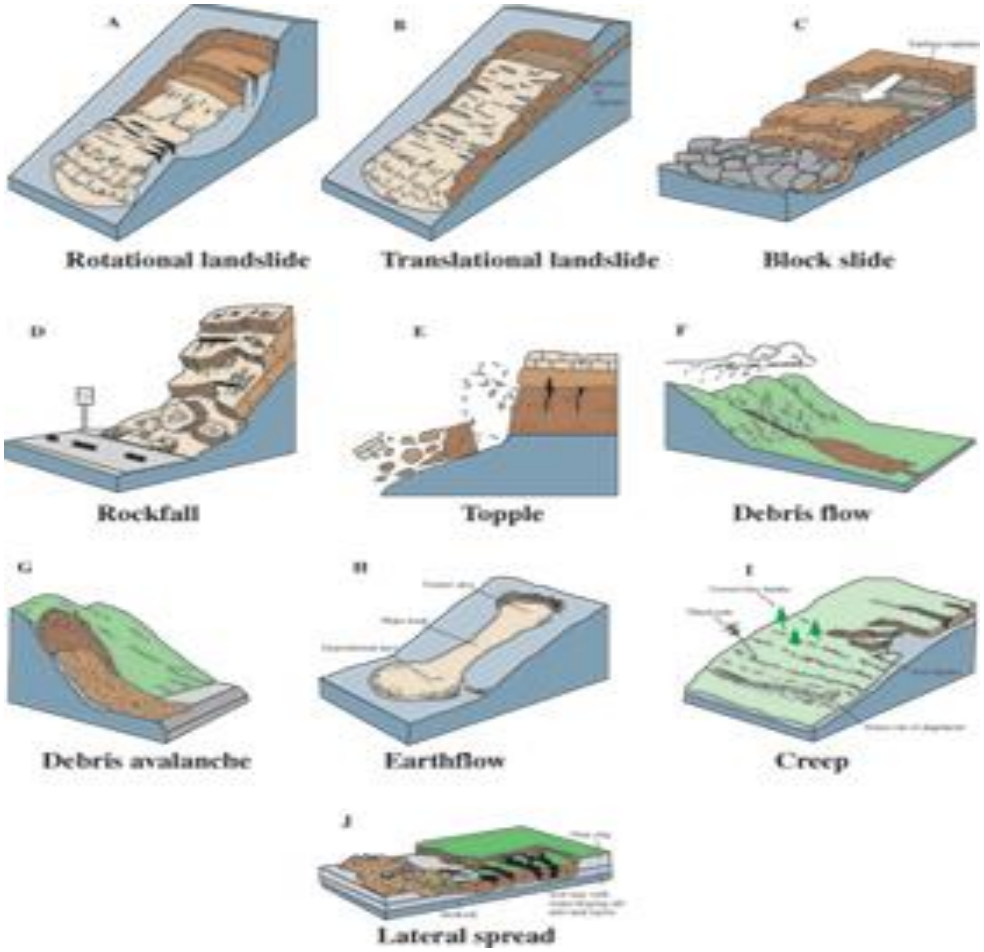


Use of Science (Cont.)

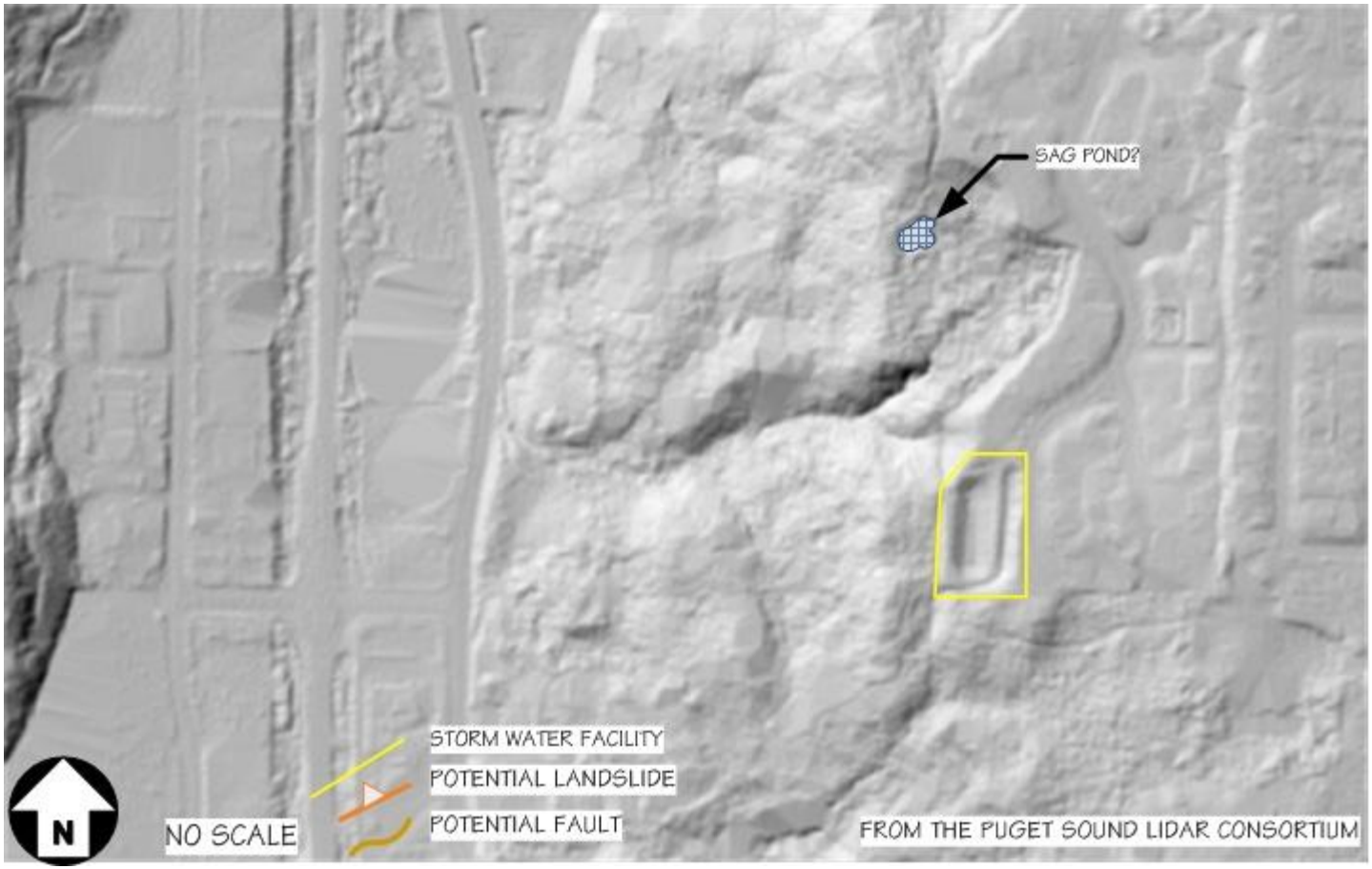
Use of Science - Landslides

- Landslide Hazards
  - Landslide hazards should only be identified and studied by licensed engineering geologists or geotechnical engineers.
  - Engineering designs to reduce landslide hazards should only be conducted by licensed geotechnical engineers. The hydrogeologic issues associated with landslides should only be addressed by licensed hydrogeologists.

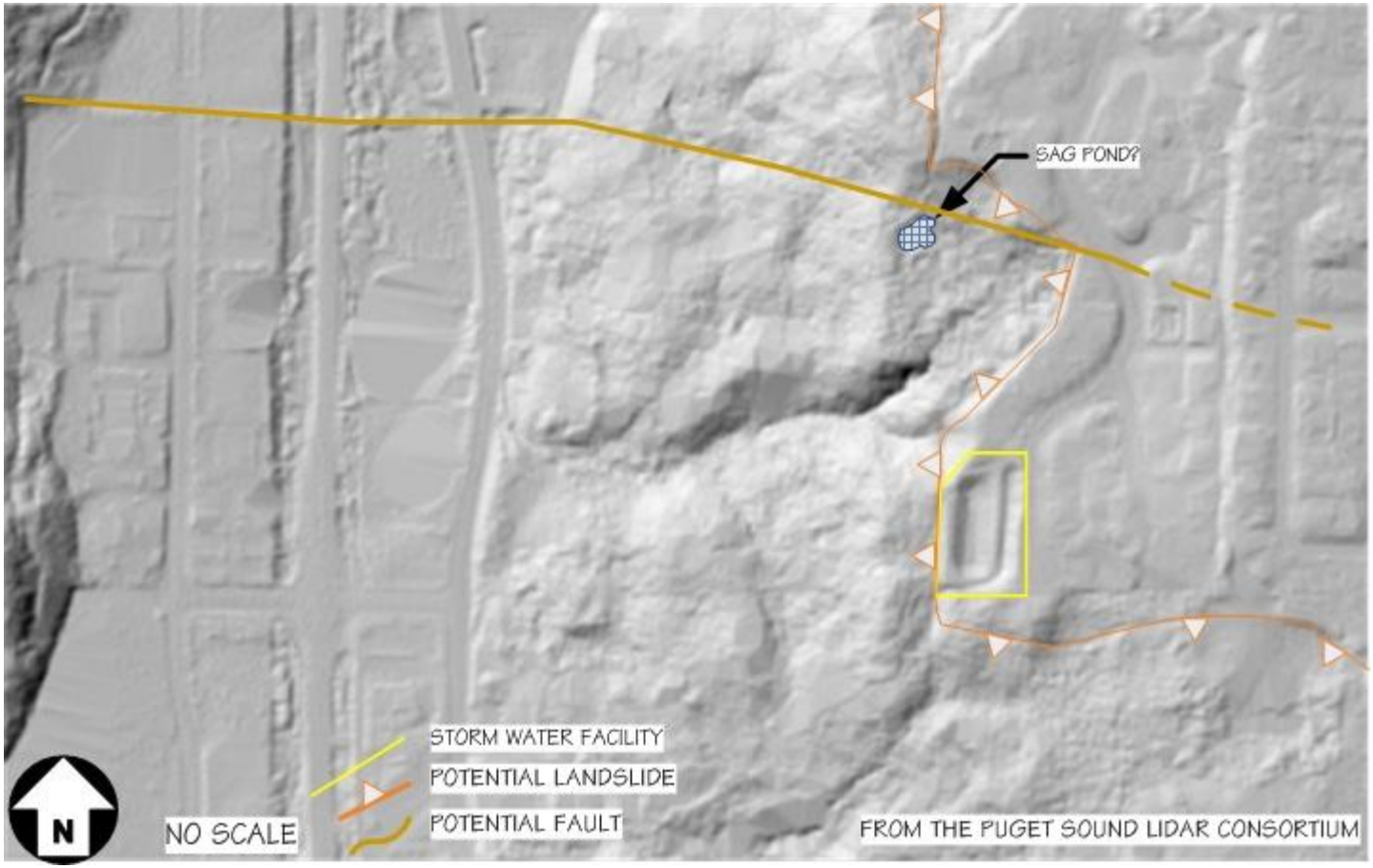
Use of Science - Landslides (Cont.)



Use of Science Seismic (Cont.)



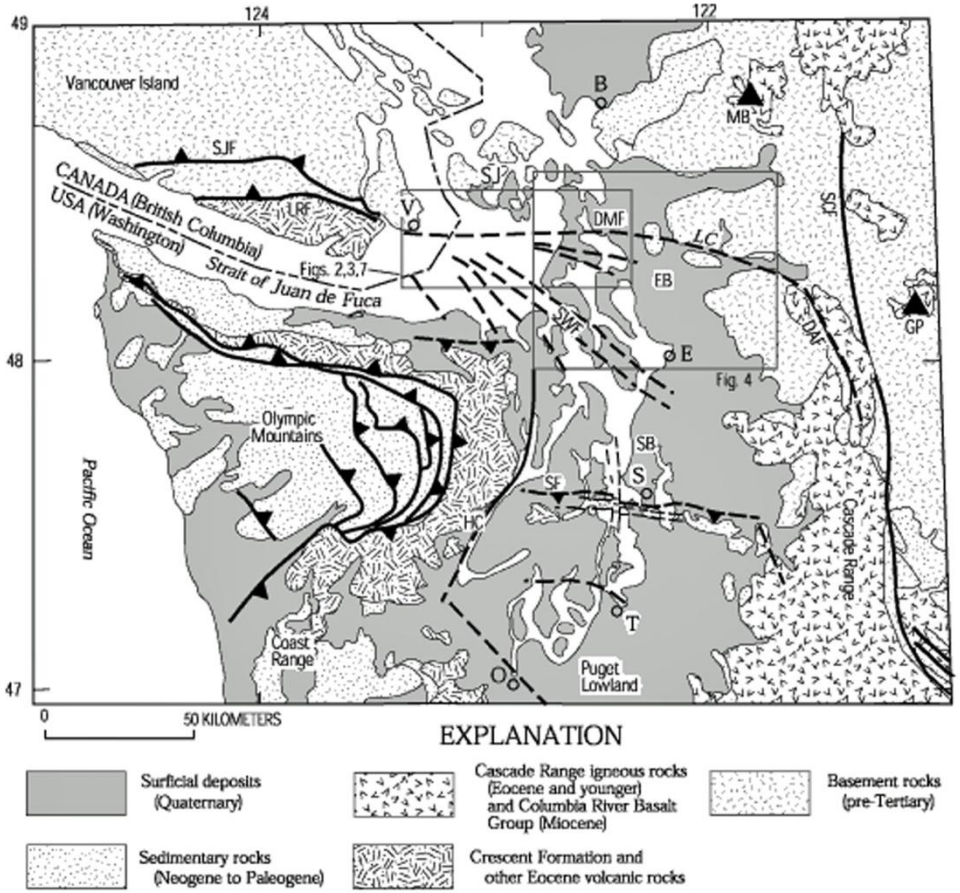
Use of Science (Cont.)



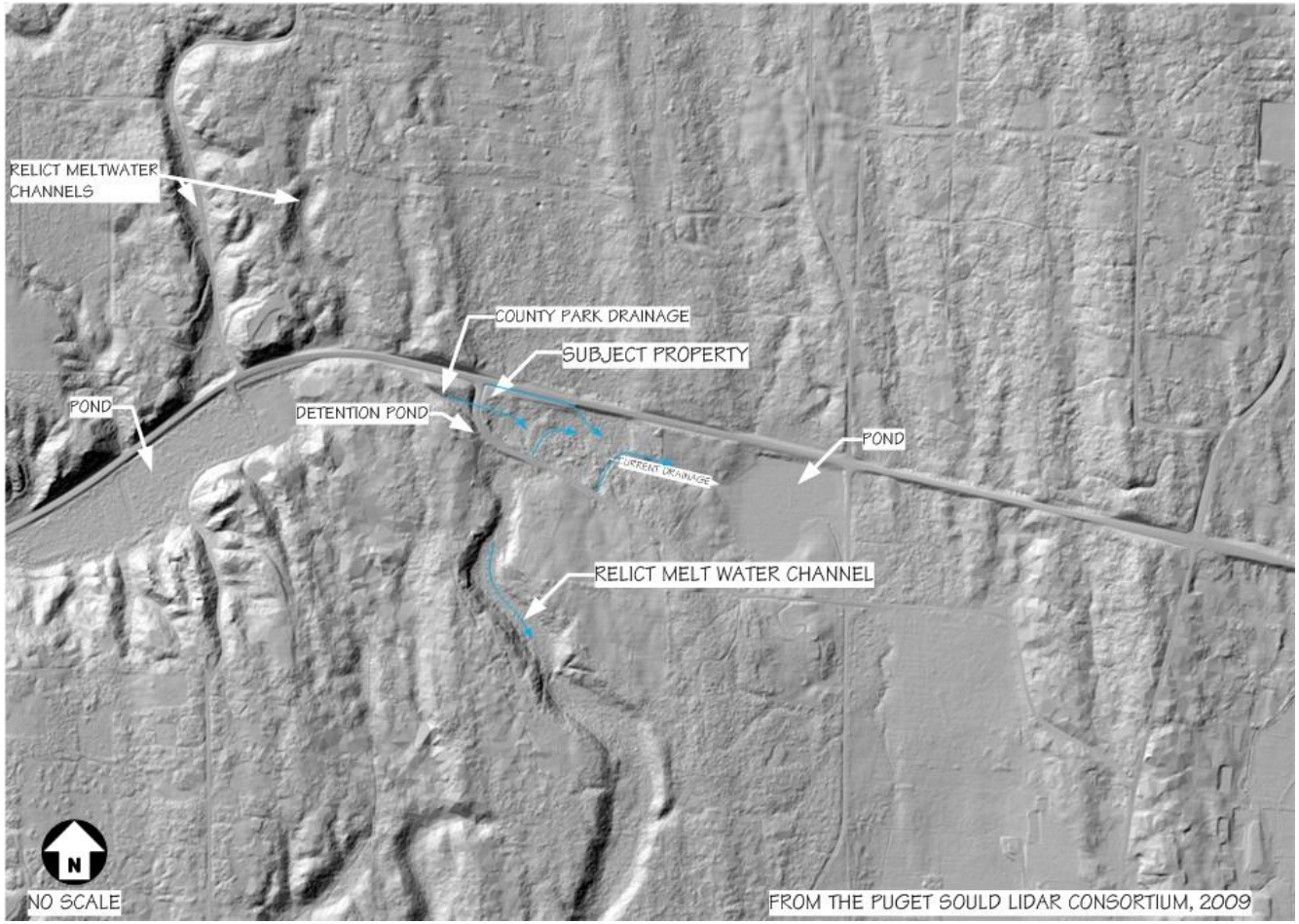
Use of Science (Cont.)

- Seismic Hazards
  - Seismic hazards studies should only be conducted by licensed engineering geologists and geotechnical engineers, or in some cases, by geophysicists.
  - Engineering design for potential seismic hazards should only be done by licensed geotechnical engineers working with licensed structural engineers.

Use of Science - Seismic (Cont.)



South Whidbey Island Fault Zone



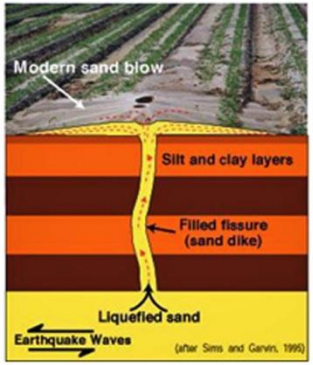
Classic Strike-Slip movement resulting in Kettle Ponds and displaced relict glacial meltwater channels, about 4 miles west of Clinton, WA on Whidbey Island

Liquefaction

- Liquefaction is one of the more devastating effects of a seismic event, especially in the Puget Lowland river valleys and in many areas where fill has been placed in areas of shallow ground water.
- One of the indicators of liquefaction is sand blows, which are very common in the Auburn and Kent valleys.
- A large part of the Seattle area is fill material washed into the Puget Sound. These "unconsolidated" sands are prime candidates for liquefaction if the ground water is present near the ground surface.
- Disruptions to the hydrologic balance have caused ground water to rise in some areas, creating new liquefaction hazards where there were none historically (e.g., the Auburn and Kent valleys).

These fountains of water can sometimes shoot as high as 30 feet into the air, according to Tuttle.

A sandboil / sandblow. Paleoseismologists can learn a great deal by studying them.



The USGS used the above illustration to diagram a sand blow.

The Enigma paper says Bootheel sand blows are commonly 1.0-1.5 meters thick, and 10-30 meters in diameter.

Portions of roads in the Bootheel could disappear entirely as the soft, sandy soil shakes and the heavy roads sink. Southeast Missourian.

Liquefaction and Structures

Liquefaction Damage

- Liquefaction can be as devastating as the actual ground shaking from a seismic event, and only occurs under special conditions of geologic deposits and ground water (and the right seismic event).
- The perfect mix is unconsolidated sands, near-surface ground water, and a significant seismic event that is located in the vicinity of this area.
- A significant seismic event can also produce ground rupture and energy significant enough to lift structures off their foundations.
- If the wave intensity and frequency are optimal, the wave can shake different parts of a structure differently, causing complete structural failure and total collapse.

Use of Science – Erosion Hazards

- Erosion Hazards
  - In an undisturbed setting there is typically no such thing as an erosion hazard.
  - Erosion hazards are identified by the presence of rills, which usually form on recently-disturbed soils, most commonly on tilled soils used for agricultural purposes, but they can also be soils that have been cleared for development.
  - All of the studies conducted by the NRCS are on tilled farm land.
  - Erosion hazards are usually covered by storm water regulations for properties that are being developed, and are not applicable to most properties.
  - Addressed by a General Construction Storm Water NPDES permit, and required on all developments of one acre or larger.
  - Will not occur unless a site is improperly stabilized, but can happen on sites where as-built storm water systems are not designed correctly, especially for storm water flows from steep, paved streets.

Rills forming at end of a steep street

Use of Science - Erosion Hazards (Cont.)

- A General Construction Storm Water NPDES permit requires a Storm Water Pollution Prevention Plan; it also requires:
- Certified Erosion and Sediment Control Lead (CESCL) to inspect the site at least weekly during the rainy season.
- The CESCL must complete a weekly report and must enter its findings in the onsite log book.
- File Discharge Monitoring Report (DMR) monthly to Ecology.

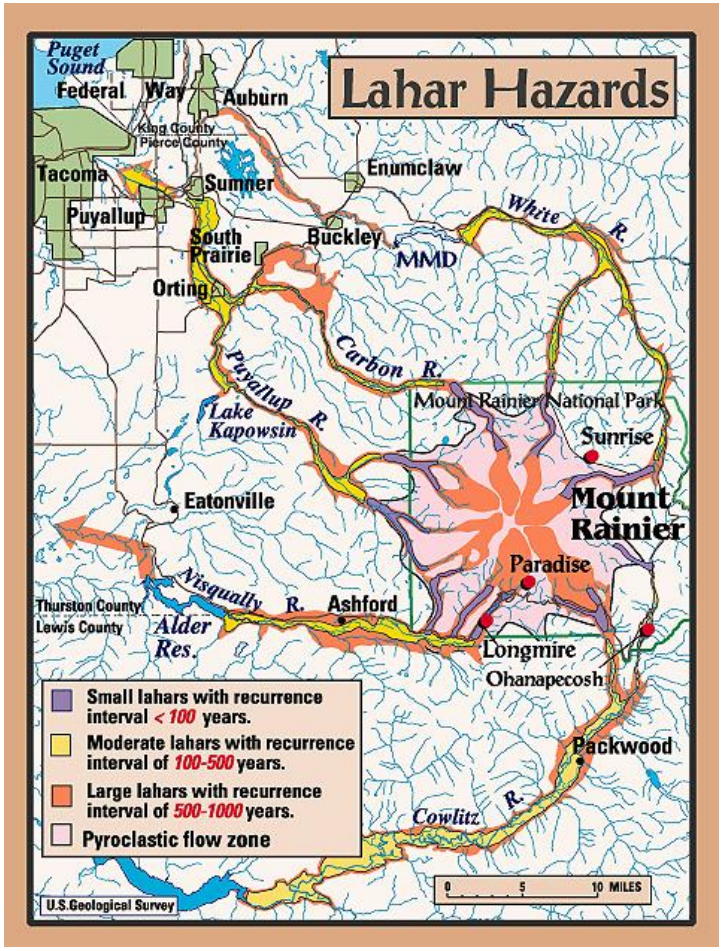
Use of Science - Hazards (Cont.)

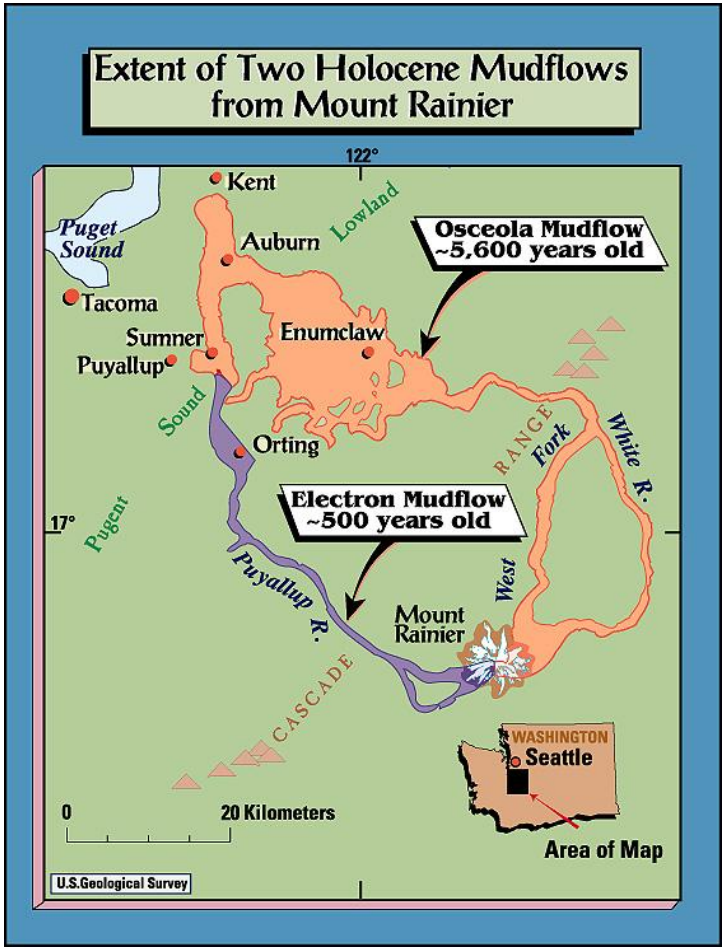
- Volcanic Hazards
  - These types of hazards should be studied by a licensed geologist only, and in some cases, engineers - who may be able to design lahar "dampeners".
  - Evacuation for lahars (mudflows), pyroclastic debris flows, and pyroclastic airborne falls (tephra). The areas where these flows will enter will need to be evacuated.
  - Flooding from intermittent geothermal activity (melting glaciers).
  - Pyroclastic cloud, especially with explosive eruption (steam explosion), can expel a 500-mph, 1100 degree F "sandstorm" that can include tephra the size of basketballs down slope of the volcano.
  - The Osceola mudflow overtopped hills 1,100 feet high near the source, and left up to 400 feet of deposits beneath the city of Auburn. The flow is believed to have extended as far north as the City of Renton, filled the Duwamish embayment, and changed the course of the White River.

Use of Science (Cont.)

- Largest known lahar is the Osceola, however, other lahars from Mt. Rainier have been large enough to have extended into the Auburn area (and some into Commencement Bay) as recently as 1,100 years ago.
- The Osceola mudflow is believed to have extended as far as Renton to the north and Tacoma to the west.

Use of Science (Cont.)



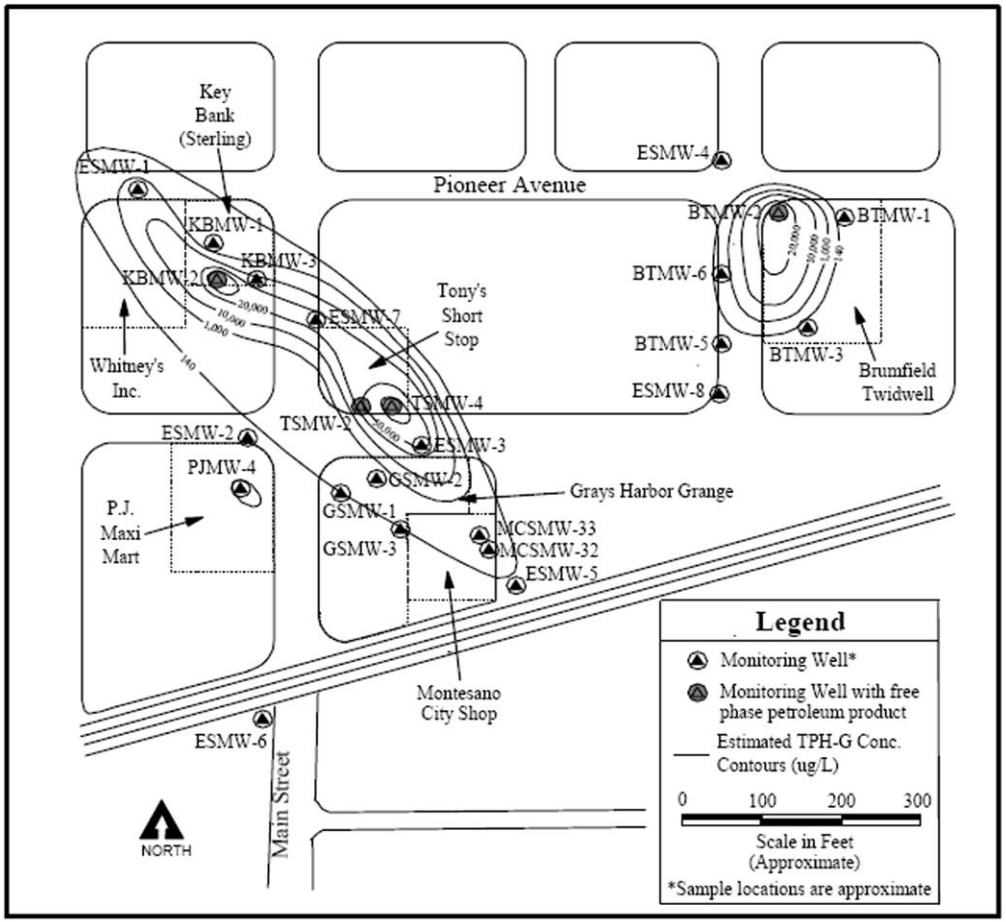


Osceola Mudflow in Enumclaw

Use of Science – Aquifer Recharge

- Aquifer Recharge
  - These types of studies should be conducted by a licensed geologist or hydrogeologist only.
  - Pertain to potential contamination of ground water and the impacts (such as reduction in ground water availability) to ground water aquifers from impacts to the watershed.
  - Includes agricultural activities, such as dairy farming, and industrial development where hazardous materials are used and hazardous wastes are generated.
  - Also applies to some commercial uses, such as gasoline service stations, dry cleaners, plating shops, leather tanning, etc.

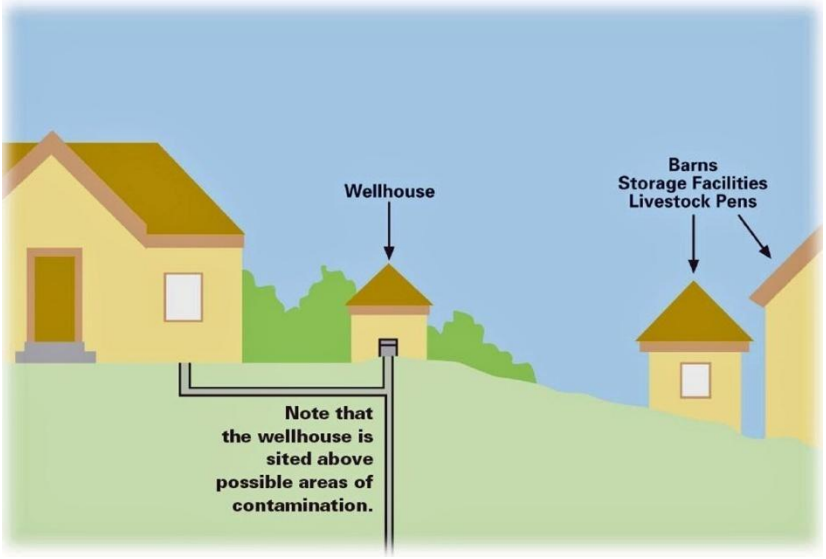
Use of Science (Cont.)

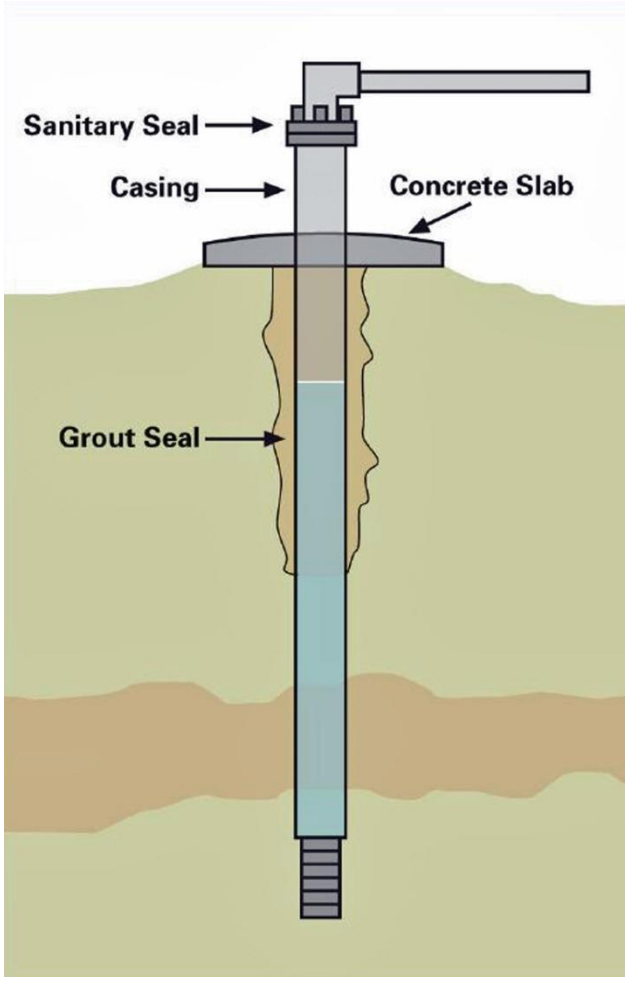


Use of Science (Cont.)

- Well Head Protection
  - These types of studies should only be conducted by a licensed geologist or hydrogeologist.
  - Purpose is to protect the water wells from impacts that could affect the water quality.
  - Only applies to developments that will have their own water supply wells or developments near existing water supply wells.
  - Includes issues related to septic systems, sanitary sewer systems, and storm water facilities (including foundation drains).

Use of Science (Cont.)





Use of Science (Cont.)

- Fish and Wildlife Conservation Areas
  - These studies are typically conducted by scientists who have had the appropriate training and experience. This includes biologists, zoologists, geologists, and others who have the necessary science background.
  - Include wildlife corridors.
  - Are the primary mechanism for regulating ponds and lakes under the Critical Areas regulations, however, even Shorelines of the State are now going to be regulated in a similar manner per the 2010 changes to the Shoreline Management Act.
  - SNR has been unable to find any local, objective, scientific studies that have been conducted in urban and rural developed areas that pertain to impacts on fish and wildlife and the need for buffers, setbacks, restoration activities, preventing docks, preventing bulkheads, or any of the many other restrictions that are implemented under the Critical Areas ordinances.

Case Studies – Wetland Area

- Site location – Auburn, WA
- Three previous wetland studies had been conducted on the subject property and surrounding area.
- Studies were conducted by wetland scientists, including studies funded by the City of Auburn.
- Studies were conducted by the Corps of Engineers (Mill Creek – Mullen Slough SAMP), but never completed (still in draft form since 2002 and only included desktop routine studies). SAMP is still being used (though never adopted and is still in "redlined" draft format).
- Studies included a "stream" that had been characterized as a tributary to Mill Creek; this stream was typed Ns – Class 3.
- The wetland areas were delineated as Category II.

Case Studies – Wetland Area (Cont.)

- The wetland areas were identified to cover an area of approximately 11.5 acres, based on other studies conducted on properties to the north, and studies conducted on and in the vicinity of the subject property.
- These areas were also shown as potential wetlands on the USFWS wetland inventory maps, USACE draft Mill Creek Special Area Management Plan (SAMP); King County, WA, April 2000 (SAMP); and the City of Auburn's Critical Areas map.
- The soils in this area were identified to be derived from glacial deposits and hydric soils, based exclusively on Munsell® colors, however, these colors were not identified on moist soils.

Case Studies – Wetland Area (Cont.)

- The "stream" was not identified and classified by a licensed hydrogeologist or hydrologist.
- The hydrology studies did not include an investigation into the sources of surface and ground water, or historical studies to determine the hydrologic regimes, or calculations for the hydrologic budget.
- The delineation activities included significant upland plant assemblages in the areas identified to be wetlands, and most of the determination of the vegetation was based on the presence of reed canarygrass - a grass that had been historically planted as fodder for livestock.

Case Studies – Wetland Area (Cont.)

- SNR Company's studies on this site indicated that the soils are not what are shown on the NRCS soils map, and are not classified by the NRCS because the parent material is not glacial – they are mudflow deposits and fill materials (including construction debris). The NRCS has not classified the mudflow soils in the Green River Valley. The only mudflow soils that have been classified are the Osceola mudflow soils, and these have only been classified in the Buckley and Lemolo areas, which are very different from the Auburn area.

Case Studies – Wetland Area (Cont.)

- All three wetland scientists that have delineated this property failed to recognize the source of the hydrology as diverted storm water into the subject property, and other sources such as the Lakehaven sanitary sewer siphon system (that discharges through the property and has known, direct sewage waste discharges to ground water on this property).
- SNR verified ongoing discharges by collecting ground water samples in the vicinity of the siphon system and having these samples tested. The samples all had high concentrations of coliform bacteria, including e. coli, and there are high levels of phosphorous and other elements that are not found in natural ground water.

Case Studies – Wetland Area (Cont.)

- SNR's studies on the property revealed that the deposits on this property are mudflow deposits that include tephra. SNR did not find any hydric soils on this property in any of the sample plots.
- SNR's studies on the property did not reveal the presence of naturally-occurring wetland hydrology in any of the sample plots.
- SNR's studies on the property did not identify any true hydrophytic vegetation that has adapted to thriving in inundated, anaerobic conditions with hydric soils (no adaptations were observed, however, no hydric soils were observed either).

Case Studies – Wetland Area (Cont.)

- SNR conducted deep test pits and logged them, finding evidence of mudflow deposits to at lest 15 feet below ground surface (BGS). Buried trees were found in these deposits. These deposits had up to 90% basalt present in the matrix, that were unconsolidated sands.
- SNR drilled and installed piezometers on the site to depths of 80 feet BGS, encountering buried trees at 60 feet BGS. SNR also found what is believed to be the Osceola mudflow at approximately 40 feet BGS.
- SNR's studies suggest ground water in 1990 was located approximately 20 feet BGS during the rainy season. During the time of the studies, ground water was observed at the ground surface, and abandoned infiltration ponds and dry wells were also observed.
- A large industrial development was constructed to the north; this development moved the "stream" to the west and installed artificial wetland areas and a storm water infiltration pond (and at least 5 other ponds).

Case Studies – Wetland Area (Cont.)

- These ponds are acting as a local groundwater recharge source, causing the ground water elevations to rise. The soils were mudflow deposits that are naturally dark (10YR 2/1 dry). There was no evidence of ground water within 2 feet of the ground surface during the growing season.
- Field studies indicated that the "stream" tributary 053 (supposedly a tributary to the Mullen Slough), was actually a King County storm water conveyance with its headwaters in a storm water detention facility located on the plateau area to the southwest.
- SNR's studies indicated that all of the historic agricultural drainage ditches and roadside storm water conveyances had been classified as streams, resulting in no maintenance, making these unlined ditches sources of local ground water recharge. SNR also found that King County was diverting an extremely large area of excess storm water into this area via relict glacial meltwater channels, with no erosion and sediment control BMPs in place (or features to slow the flow of the storm water).
- SNR found that King County had installed some storm water detention facilities, but no storm water conveyances anywhere in the Mill Creek and Mullen Slough drainage basins that were studied. SNR also found intentional blockages to the agricultural drainage ditches to create duck hunting areas, which also resulted in localized groundwater recharge.

Case Studies – Wetland Area (Cont.)

- SNR was able to prove Tributary 053 was a storm water conveyance (which later King County studies verified) and that it, along with several other storm water conveyances being discharged into this area were responsible for frequent flooding of private property and the "appearance of "wetland" conditions", but these were surface water related only, and did not result in the formation of saturated soils, nor were hydric soils formed in the lahar deposits in this area.
- SNR also found that the movement of Tributary 053 to the west was unstable, and that this would move back to its original position, which happened on December 7, 2007, with this conveyance now discharging into the storm water "wet" detention pond on the Span Alaska property.
- SNR was able to prove that none of the areas previously identified by wetland scientists or the USACE were wetland areas, and that the stream identified as tributary 053 was not a stream – it was a King County storm water conveyance (that did not have easements for the properties it was located on). SNR also noted that none of the storm water conveyances in this area had easements, and none met the requirements of the King County Municipal Storm Water NPDES permit, or Title 9 of the King County Code. These also did not meet the requirements of the KCSWDM of 2005, or the Storm Water Management Manual for Western Washington, 2005 which puts King County is in violation of their Federal permit.

Case Studies – Wetland Area (Cont.)

- SNR's stream reconnaissance studies did not identify any critical areas streams to be present on the subject property.
- A manmade storm water conveyance (recent) had been misidentified as a stream. This conveyance did not exist prior to 1990, when storm water from the west was collected in ponds that bounded the eastern portion of the subject property. These ponds drained into a dry well until the ground water in the area rose to a point where the infiltration of the water was no longer an option (the ponds stopped draining). The storm water was then diverted to the north and northeast to discharge into the storm water ditch that bounds the west side of West Valley Highway.

Entire Text of Wetland Delineation

MEMO

Re: Omega-Baja Site Development SEPA Checklist Addendum
Tax Parcels 000221049001, 0221049098, 0221049079

I conducted a critical areas evaluation for a proposed project in the City of Auburn, Washington. The tax parcels identified above are owned by Omega-Baja Industrial Contractors, Inc. This report is for delineation and initial feasibility assessment purposes.

The project site covers approximately 6.25 acres of mostly light industrial land. There are two single-family residences being used as offices on the site and one outbuilding. The majority of the property has been cleared and used for light industrial production and storage. It is known that a portion of the property supports wetlands that are regulated under the City of Auburn Critical Areas Ordinance Title 16.10.

I conducted a search of the National Wetlands Inventory, King County and Soil Conservation Service maps and other available existing data sources. Both the NWI data base and the King County map indicated no known wetlands on or immediately adjacent to the site. The SCS maps show a preponderance of hydric soils on and adjacent to the property. The King County Map Folio shows an unclassified stream running through the western side of the property. A Washington Department of Fish and Wildlife Natural Heritage Data Base search has also been conducted. A small portion of an Urban Natural Open Space is located on the southwestern corner of the property. No threatened or endangered species of plants or animals are known to occur on or within 1,000 feet of the property.

The City of Auburn requires that site specific wetland investigations be conducted using methods outlined in *Washington State Wetland Identification and Delineation Manual (Ecology #96-94)*. Identified wetlands will be given a qualitative rating based on *Washington State Wetland Rating System for Western Washington (Ecology Pub. #04-06-025)*. Sensitive areas boundaries that may be on properties adjacent to proposed impact zones must also be considered as potential impact areas.

I visited the site on January 29, 2007 and performed a wetland delineation for the portion of regulated wetlands on the property. The wetland identified is part of a much larger system on properties to the north and west. There are three classes of wetland on the property, Palustrine Forested, Palustrine Scrub/Shrub and Palustrine Emergent wetland. This wetland is contiguous with wetlands on adjacent properties where open water classes are also present.

The unclassified stream crossing the western edge of the property is an ephemeral stream, averaging less than a foot in width and less than 1 cfs during high flows. Class IV streams "are those natural streams and drainage swales with channel width less than two feet taken at the ordinary high water mark, that do not contain fish habitat." The stream appears to have no outlet other than potentially into the local storm sewer system. It does not provide habitat for fish and there is no access for fish during even extremely wet seasons.

The Palustrine Forested wetland comprises the largest percentage of the wetland. It is dominated by deciduous tree species: black cottonwood, red alder and willow. The Palustrine Scrub/Shrub wetland is nearly as extensive as the forested type and is dominated by: thimbleberry, willow, red-osier dogwood and Himalayan blackberry. The Palustrine Emergent wetland is relatively small. It is dominated almost exclusively by reed canarygrass. All wetland classes have small components of lady-fern, buttercup and horsetail in them.

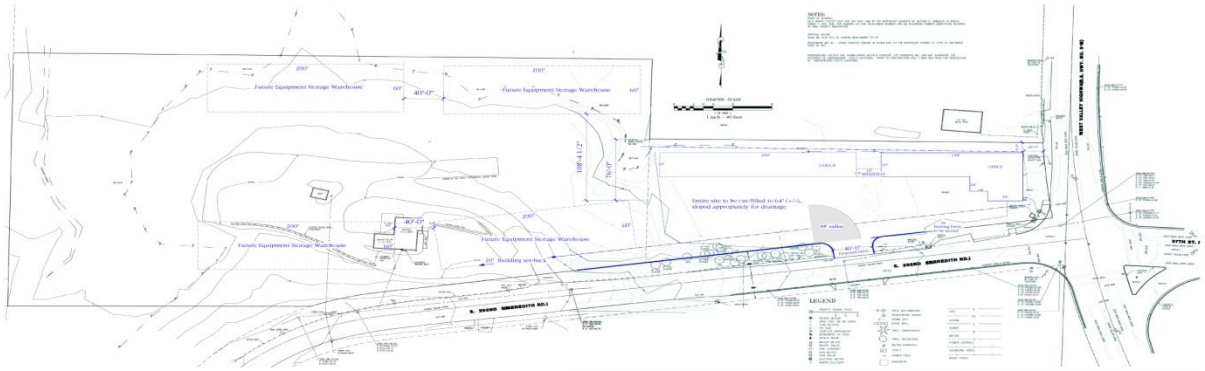
The soils in the wetland are a complex of Norma sandy loam and Seattle muck. Both soils are considered as hydric soils, are very heavy in organic matter, and have upper horizons very dark in color (10YR 2/1 to 2/2), and heavily mottled below 10 to 12 inches in depth. Soils in the wetland were saturated with most sample points having free water at the surface.

Most of the upland portion of the site has been disturbed for use in light industrial purposes and is no longer vegetated. Vegetation on the disturbed/fill material is predominantly Himalayan blackberry and non-native grasses. The remaining vegetated upland habitat is primarily deciduous forest, dominated by big-leaf maple, red alder, and sword-fern. Nearly all upland soils on the property have been modified from native soil conditions by placement of fill material. The original underlying upland soils are presumed to have been of the Alderwood Soil Series.

This wetland and its contiguous portion on immediately adjacent properties has a Category 2 rating based on methodology provided by DOE Pub. 04-06-025. The minimum buffer width for a Category II wetland is 50 feet. Nearly all buffer vegetation has been removed on this site.

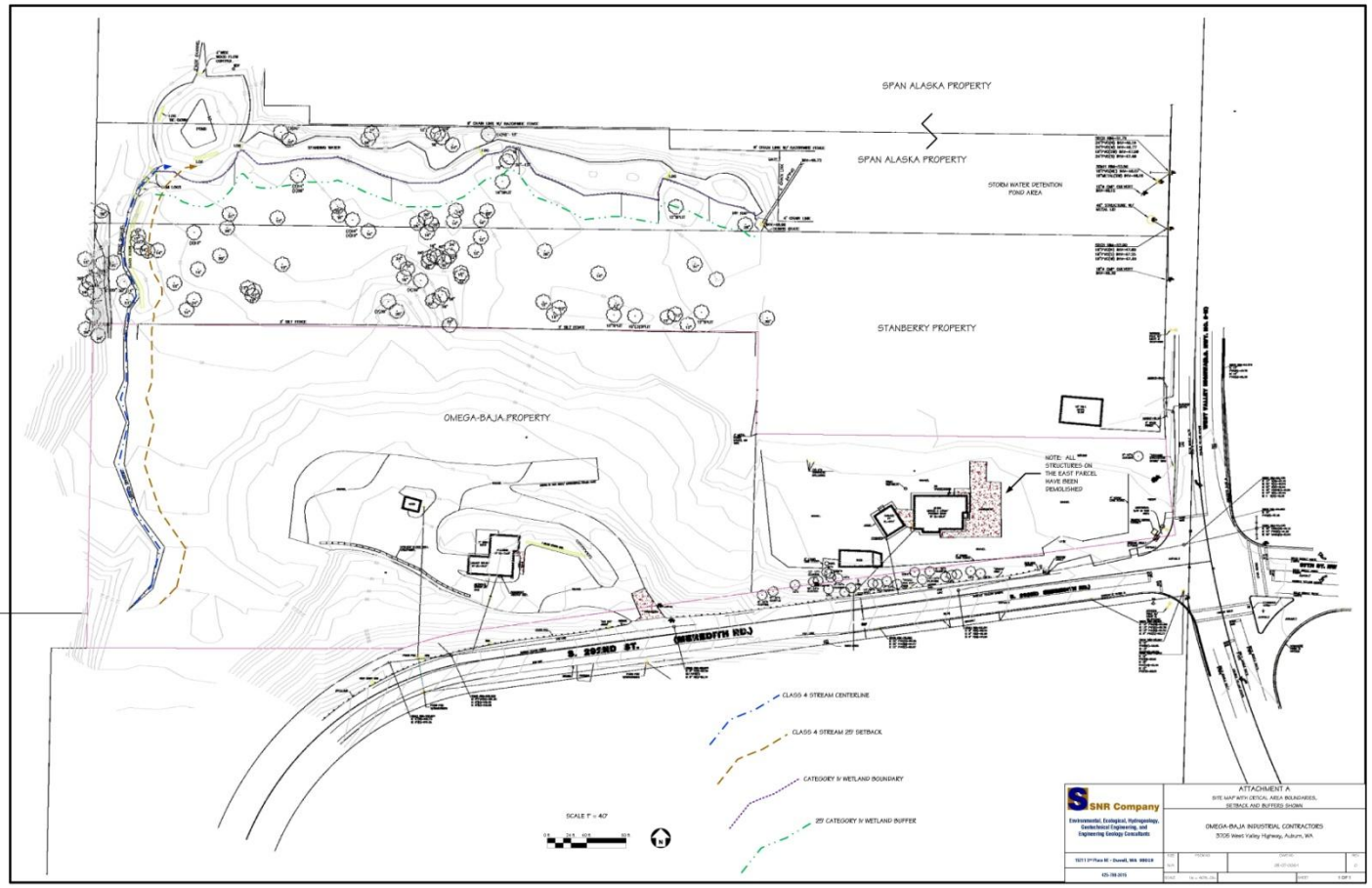
Kenneth E. Neiman, Ph.D.
Certified Senior Ecologist

Wetland Map from Nieman



Note: 2/3 of the property was either wetland areas or buffers, per the 2-page wetland report by Dr. Nieman.

Critical Areas After SNR Studies



Note: SNR did not identify any wetland areas on subject property or adjoining property (a total of over 10 acres of property). This restored all 10 acres to full development potential, due to proper studies.

Case Studies – Wetland Area (Cont.)

- Development on the property to the north included the "illegal" diversion of the storm water conveyance to the west, where it intercepted relic agricultural drainage ditches, resulting in flooding to the north.
- A new ditch (the "venture ditch") was excavated by residents to the north to redirect the flows from the south into the storm water drainage ditch that bounds the west side of West Valley Highway.

Case Studies – Wetland Area (Cont.)

- SNR's wetland studies revealed that there were no ratable wetland areas on the subject properties or other properties to the north of the subject property.
- These studies removed all previously-identified wetland areas, resulting in acceptance by the City of Auburn, and a SEPA determination of non-significance for the grading activities that will be conducted on the entire property.

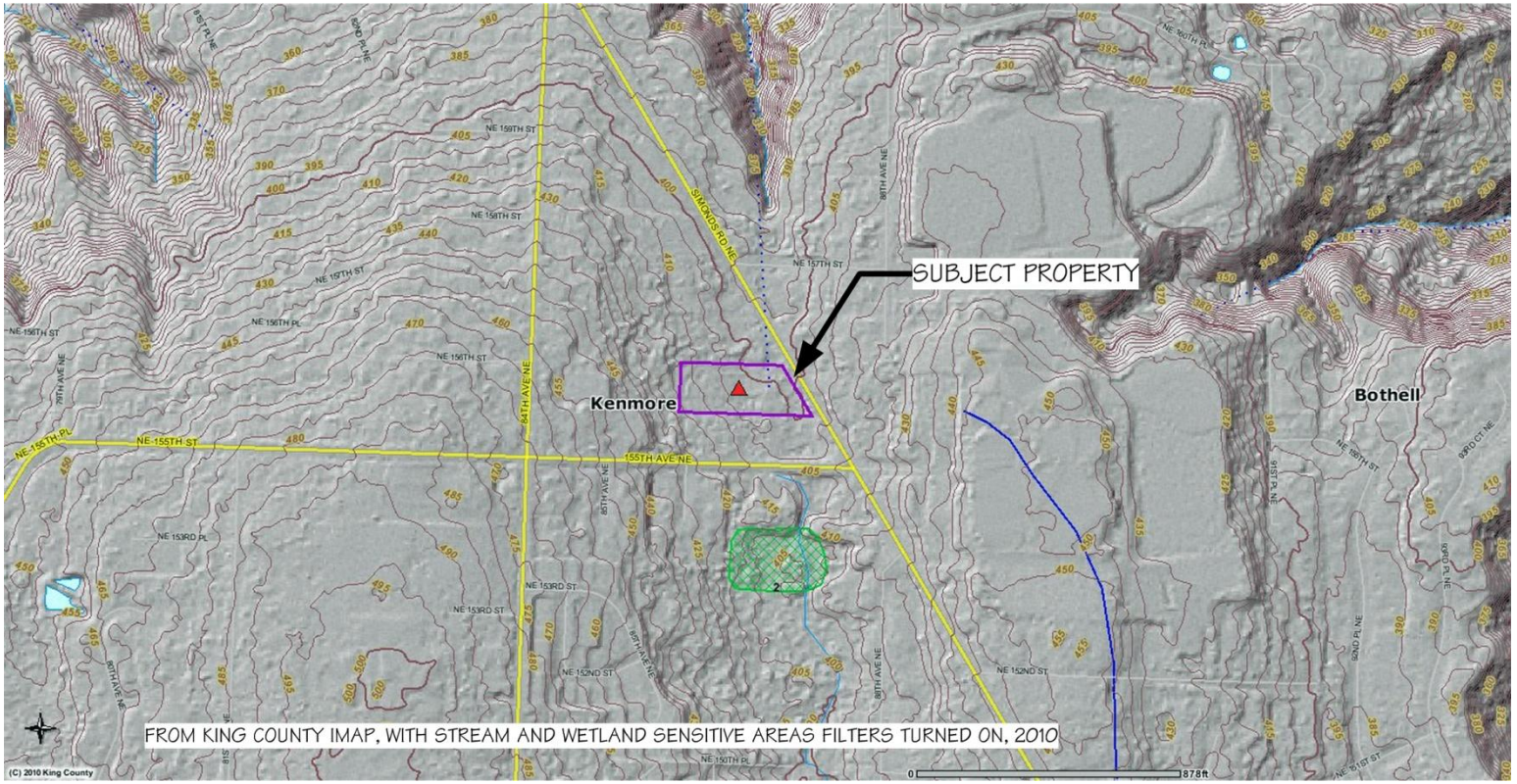
Case Studies – Wetland Area (Cont.)

- These studies disqualified over five acres of land from being wetland areas, at a value of $500,000 per acre (per the client).
- The "stream" was determined to be a storm water conveyance with setbacks of 25 feet from the conveyance banks and no building setbacks. As a compromise to expedite approvals, this conveyance was named a City of Auburn Class IV Critical Areas Stream with 25-foot setbacks and no building setbacks. However, the report still states it is not a stream, but is a storm water conveyance.

Wetland Study - Kenmore, WA

- A client wanted to subdivide an approximately 5-acre parcel in Kenmore to build a new home to replace the 1920's vintage residence on the property with a home that had handicapped access so he could bring his wife home from the hospice facility.
- The City of Normandy Park required Critical Areas studies because wetland and streams had been identified on other properties in the area by wetland scientists.
- SNR conducted preliminary studies, and all of the data suggested that no wetland areas should be present on the property (soils, hydrology, and all other research suggested that the hydrology and soils required for a wetland should not be present).
- SNR conducted field studies on the property and found that the City of Normandy Park had diverted storm water onto the property from the south and west, with the City claiming the water from the south to be a stream (even though it came from a type 1 manhole and the source of the manhole water was the City MS4 roadside ditch system on NE 155th Street).
- The subject property is located at the base of a hill (a relict glacial drumlin) and because of this, there are numerous unlined storm water ditches along property lines and perpendicular to the slope of the hill.

King County Critical Areas Map



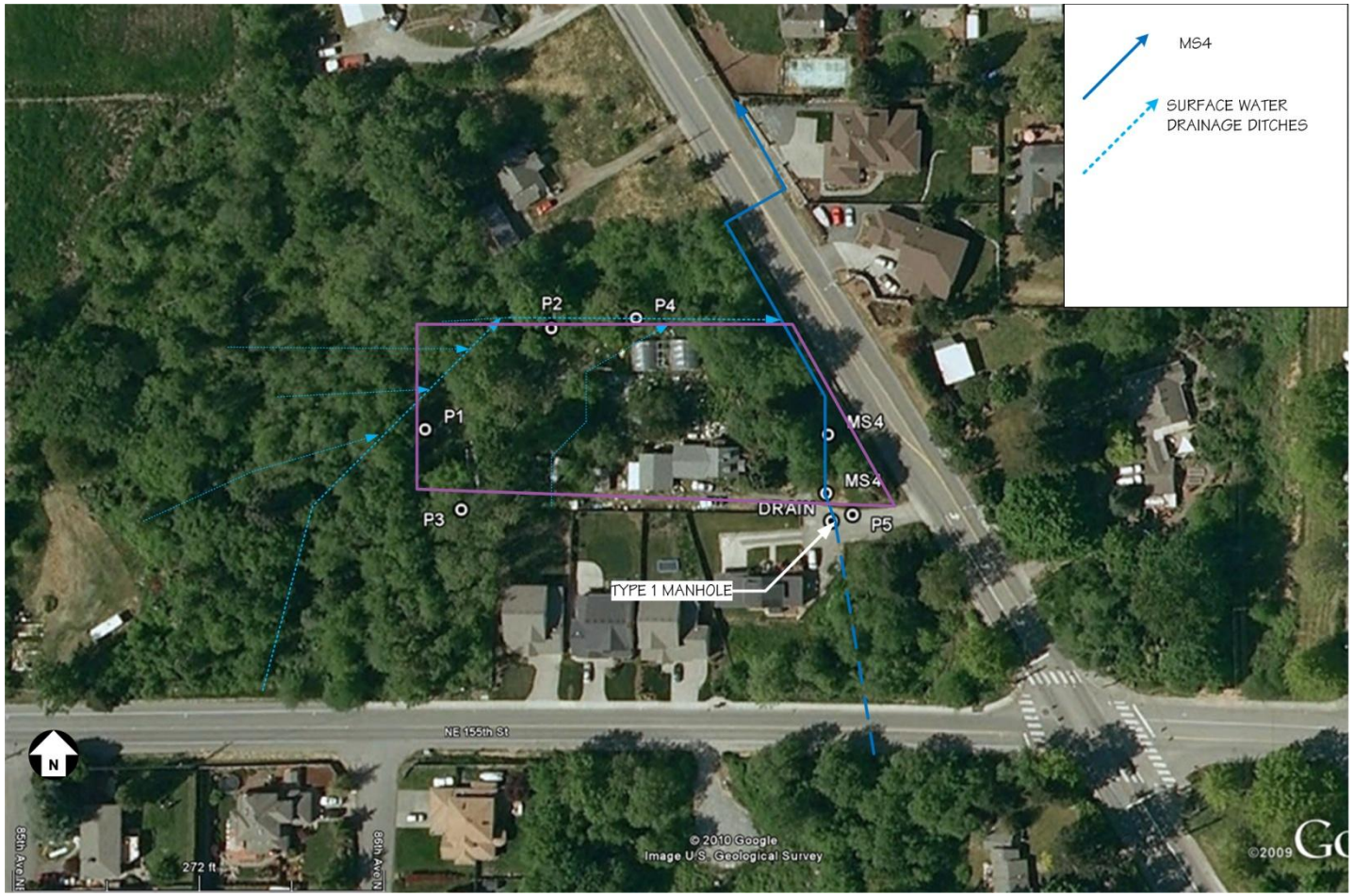
Field Studies

- The subject property has been used agriculturally since the 1920s and has never had drainage problems, other than King County (at the time) diverting storm water across the eastern portion of the property.
- No maps of any kind, including wetland inventory, historic USGS topographic maps, and even NRCS soils maps suggest that the subject property would have wetland areas present on it.
- Due to the diversion of storm water onto the slope to the west, however, the subject property did have issues with surface water, and this is why the ditch system was built. Additionally, after the properties to the south were developed in 2005, surface water did begin to run onto the subject property from the south. It appears that the contractor combined all of the impervious surface storm water and diverted it into one undersized infiltration facility located immediately south of the subject property, and overflows from this facility flowed onto the property, which is covered mostly with a thin layer of Alderwood soils (formed in glacial till) that are underlain with advance outwash deposits (sands).
- SNR conducted the field studies on June16th, which was one of the wettest June months on record (16 straight days of rain, including the day field activities were conducted); however, ground water was not encountered in sample plots conducted to 30" BGS, or in any of the highly-disturbed soils (including significant quantities of fill having lots of organic fill materials). Alderwood soils contain up to 10% volcanic ash and tephra.
- SNR found that there were no ratable wetland areas on the subject property or within 200 feet of the subject property, and that there were no streams on the property (by regulatory definition); the water was derived from a roadside ditch MS4 (municipal separate storm sewer system) in a City with a Phase II Municipal Storm Water NPDES permit, and was tightlined to a type 1 manhole which was tightlined to a manmade MS4 storm water conveyance across the eastern portion of the subject property to the southeast, eventually draining into the western MS4 ditch bounding Simonds Road NE. The roadside ditch storm water flowed north approximately 445 feet before entering a type 1 catch basin where the storm water was tightlined and crossed Simonds Road NE. The storm water travels in a tightline approximately 2,400 feet to the northeast, where it outfalls into a "stream" (the Sammamish Slough – AKA the Sammamish River), approximately 1.3 miles east of where this "slough" discharges into Lake Washington.
- The City of Kenmore insists that the MS4 system is a stream, and brings in the WDFW who agree that it is a stream – even though the City's Phase II Municipal Storm Water NPDES permit specifically indicates that this is a point source MS4, and if it were a stream, the City would be discharging a receiving water (a stream) into a point source water (the MS4), which is expressly prohibited by their permit and other provisions of the Clean Water Act and the Safe Drinking Water Act.

Challenges

- The City does not want to be exposed to the potential liability of inverse condemnation on the subject property for diverting its storm water onto private property, which would also be a violation of their Municipal Storm Water NPDES permit.
- The City does not want to be liable for using the subject property for the detention and conveyance of their storm water on the subject property (by diverting storm water upslope of the property to the west, and for using a private drainage ditch system for their storm water conveyance – which is a violation of their permit).
- The City had a wetland scientist conduct studies to determine that wetland areas are present on the property and that the MS4 conveyances are streams, even though a wetland scientist is not licensed as a hydrogeologist and cannot challenge a signed, stamped report. However, the wetland areas the wetland scientist identified are in the manmade storm water drainage ditches.

Storm Water Ditches and Surface Water Flows Map



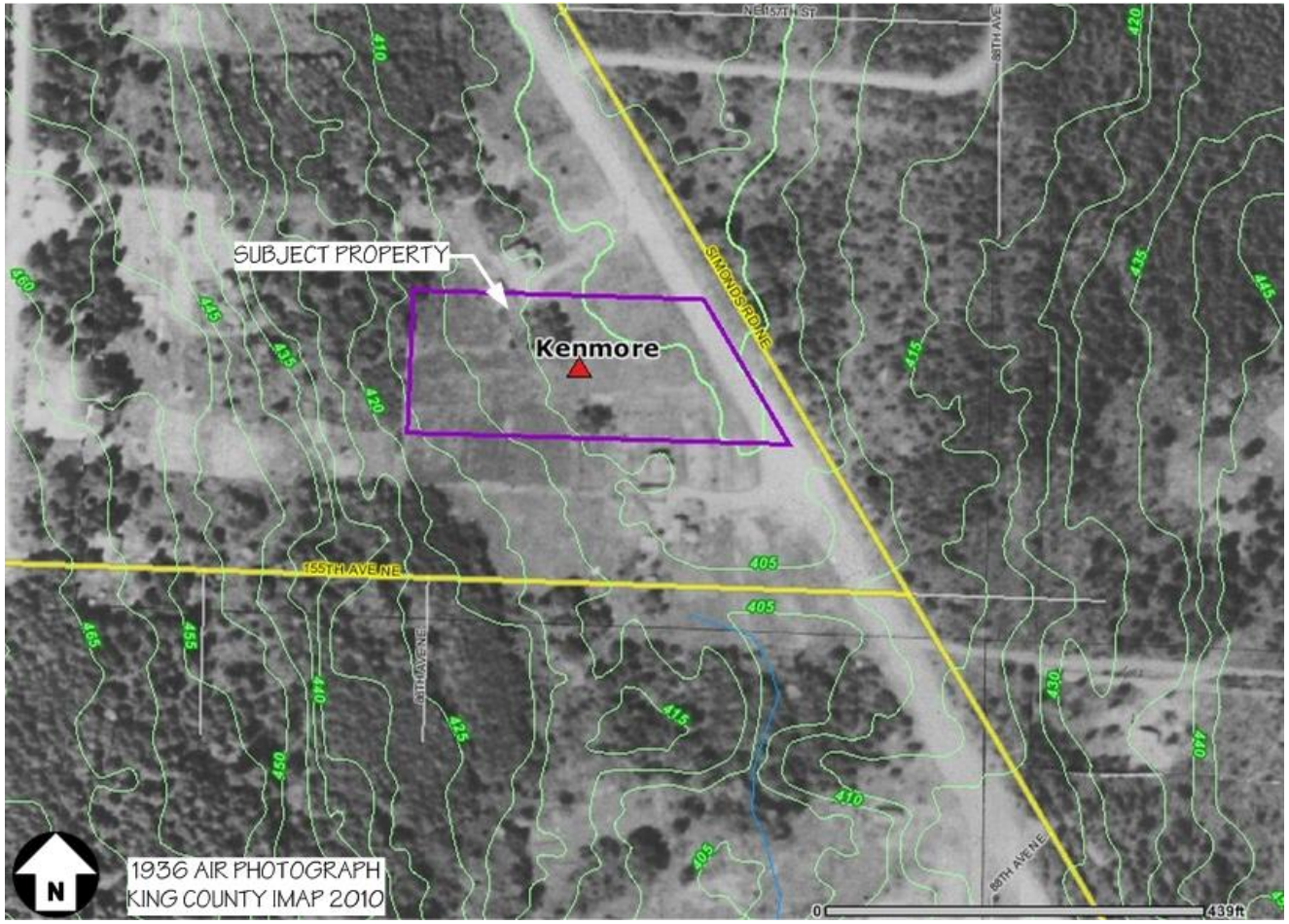
Challenges (Cont.)

- The Wetland Consultant (Adophson) does not review SNR's wetland report, and only looks at the wetland delineation forms, without knowing that the storm water ditches are located on the property.
- The City wants SNR to conduct more studies to determine if hydrology is different on other portions of the property, obviously not understanding the hydrogeology and the characteristics of ground water (and the piezometeric surface), and believes that if SNR did not find ground water within 30 inches of the surface after 15 days of rainfall in 8 different test plots across the site, there would be no need to conduct further tests at the client's expense.
- The City decides to bring in Ecology to conduct wetland studies on the site, after bringing in a WDFW officer who has no license or any other qualifications for identifying streams and obviously does not know Federal Clean Water Act regulations, especially those in the Phase II Municipal Storm Water NPDES permit (Section 402) and Water Quality (Section 401).
- The WDFW determines the MS4 is a Type N stream, which means the City is in major violation of the Clean Water Act because they are discharging receiving waters into a point source system.

Challenges (Cont.)

- Ecology arrives onsite and advises SNR that we are "unqualified" and that our report is completely wrong, and then proceeds to the area where the unlined manmade storm water ditches are located and conducts their test plot right at the base of the slope in the ditch.
- It is obvious Ecology has not read SNR's report, and even though SNR advised Ecology in the field that they were conducting their test plot in an unlined drainage ditch, Ecology stated "We are Ecology – we can do whatever we want".
- When reminded that the GMA and the SMA state: **"Wetlands do not include** those artificial wetlands intentionally created from nonwetland sites, **including, but not limited to, irrigation and drainage ditches**, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas to mitigate the conversion of wetlands", Ecology responded, "We are from Ecology; we can do as we please".
- The soils observed in the test pit were highly disturbed because this is an excavated ditch on a site that has been used agriculturally, and following clear cut tree-harvesting activities was tilled and farmed (including orchards). Ecology believed that they had observed redoximorphic features; but those they observed were oxidation features that were not associated with living roots and are normally found in ephemeral drainage ditches.

Subject Property in 1936



Problems with Ecology's Best

- SNR observed the samples under a hand lens – something the Ecology representatives say they never bother with – and found that the "redoximorphic features are inclusions of an "E" (eluviated) soil horizon that have been mixed into the "A" soil horizon (a sand). The NRCS specifies (as do the manuals) the need to be cautious about misinterpreting a mixed "E" soil horizon on tilled sites with redoximorphic features. Ecology misidentified the redoximorphic features and misidentified the soil moisture, which they claimed was a saturated sand.

Ecology taking Munsell® Color Readings on a "saturated" sand.

More Problems

- Ecology determined that the sand (loamy sand) was saturated within 1 foot of the ground surface and that ground water was located at 2 feet below the ground surface.
- When SNR asked Ecology for the definition of saturated soils, they had to refer to the manual, and without referencing the glossary they simply looked in the hydric soils section of the Corps Regional Supplement (which lists numerous types of hydric soils) and also requires the use of the 1987 Manual. They said "it glistens", which is not the definition for saturated soil, and had the sand been saturated, it would have flowed into the test pit and been a "slurry", completely filling the test hole (sample plot). The sand did not do this, however, Ecology assumed that the sand was saturated, and then compared it to the Munsell® color charts. That was clearly a mistake, because they refer to the color of **moist** soil, **not saturated** soil.
- In addition, the seep Ecology saw is called an "unsaturated zone preferential flow" which is common at the base of slopes. It is not an indicator of ground water, and Ecology would know this if they were licensed hydrogeologists or if they had read the "Keys to Soil Taxonomy", NRCS, 10th Edition, 2006, section on aquic moisture regimes (which is what is required for wetland hydrology) as this is a saturated moisture regime.

Ecology determining that redoximorphic features are present in soils that have been disturbed and have an "E" horizon mixed with the "A" soil horizon, as observed by SNR with a hand lens, (which Ecology claims they "never need to use").

Munsell® Colors MUST be from Moist Soil

- Per the State1987 Corps Manual, and the 2010 Corps Regional Supplement, and all of the NTCHS and NRCS documents, the soil color documented for hydric soil determinations MUST be for moist soil, not dry, wet, or saturated soil!

Figure 3.—The left shows moist soil colors, and the right shows dry soil colors. Moist soil colors are to be used when hydric soils are identified. The moist soil colors in this picture would meet the requirements for indicator F6 (Redox Dark Surface), but the dry colors would not meet these requirements.

Munsell® Color Chart Page

From the Corps of Engineers Regional Supplement to the 1987 Manual, May 2010

Figure A1. Illustration of values and chromas that require 2 percent or more distinct or prominent redox concentrations and those that do not, for hue 10YR, to meet the definition of a depleted matrix. *Due to inaccurate color reproduction, do not use this page to determine soil colors in the field.* Background image from the Munsell Soil Color Charts reprinted courtesy of Munsell Color Services Lab, a part of X-Rite, Inc.

What is Moist?

- The 2010, Version 7 of the NRCS Field Indicators states:
  - All colors noted in this guide refer to moist Munsell® colors (Gretag-Macbeth, 2000). Dry soils should be moistened until the color no longer changes, and wet soils should be allowed to dry until they no longer glisten (fig. 3). Care should be taken to avoid over-moistening dry soil. Soil chromas specified in the indicators do not have decimal points; however, intermediate colors do occur between Munsell® chips. Rounding should not be used to make chroma meet the requirements of an indicator. A soil matrix with chroma between 2 and 3 should be described as having chroma of 2+. It does not have chroma of 2 and would not meet the requirements of any indicator that requires chroma of 2 or less. Always examine soil matrix colors in the field immediately after sampling.
  - Ferrous iron in the soil can oxidize rapidly and create colors of higher chroma or redder hue. Soils that are saturated at the time of sampling may contain reduced iron and/or manganese that cannot be detected by the eye. Under saturated conditions, redox concentrations may be absent or difficult to see, particularly in dark colored soils. It may be necessary to let the soil dry to a moist state (for 5 to 30 minutes or more) for the iron or manganese to oxidize and the redoximorphic features to become visible.

What is Moist?

- In reality, some soils, especially those that are silty or clayey cannot be dried to "moist" conditions in the field (moist is an arbitrary term), because there is no clearly-defined level of moisture for a specific soil that makes it moist. Each soil will have a different "optimum" moisture in geotechnical engineering, but this is not a definition of what "moist" means in NRCS soil methods (there is no scientific method in the NRCS, because there is no definition for moist – simply because this will vary with every soil, except as a percentage of water per weight, which is what SNR uses).
- Each soil type will retain moisture differently; coarse sands drain easily and it may be possible to dry these to moist conditions in the field, depending on the field conditions. However, most soils that develop hydric soil characteristics are fine soils (silty fine sands, silts, clayey silts, and occasionally, silty clays). It is virtually impossible to dry these fine materials to "moist conditions", if they are wet or saturated, in the field. The only way to do this is to use ASTM methods to completely dry the soil and then add water to a known moisture percent based on weight. SNR uses 10% moisture by weight as a generally-accepted level of water-to-soil ratio for "moist" soils. There are more expensive and complex ways to obtain "moist" conditions based on the actual grain size and hydrometer analysis, but this would require extensive lab time and is costly.

What is Saturated?

- The definition for saturated soils varies, depending on who defines it.
- To hydrogeologists, saturated conditions occur when all interstitial pore space in the deposit are completely filled with water at a pressure equal to or greater than one atmosphere. This defines the potentiometric or piezometric surface, which is the "top" of the ground water. The saturated zone below the ground water surface is called the phreatic zone, which is the aquifer that is saturated with ground water.
- The NTCHS defines saturation as "Wetness characterized by zero or positive pressure of the soil water. Almost all of the soil pores are filled with water." (from Version 7 of the Field Indicators glossary).
- The Corps of Engineers defines saturation as: Saturation. For wetland delineation purposes, a soil layer is saturated if virtually all pores between soil particles are filled with water (National Research Council 1995; Vepraskas and Sprecher 1997). This definition includes part of the capillary fringe above the water table (i.e., the tensionsaturated zone) in which soil water content is approximately equal to that below the water table (Freeze and Cherry 1979) -taken from the Regional Supplement, May 2010.
- The NRCS defines saturation as an aquic moisture regime, which is provided in two manuals (the definitions are the same in each manual) - "Keys to Soil Taxonomy", Survey Staff, 11th Edition 2010; and "Soil Taxonomy, A Basic System of Soil Classification for Making and Interpreting Soil Surveys", 2nd Edition, 1999, Soil Survey Staff. This is presented on the next slide because it is a very detailed and lengthy definition, which actually includes a large section of text, because there are many different moisture regimes associated with the aquic moisture regime.

What is Saturated? (Cont.)

- Soils with aquic (*L. aqua = water*) conditions are those that currently undergo continuous or periodic saturation and reduction. The presence of these conditions is indicated by redoximorphic features, except in Histosols and Histels, and can be verified by measuring saturation and reduction, except in artificially-drained soils. Artificial drainage is defined here as the removal of free water from soils having aquic conditions, by surface mounding, ditches, subsurface tiles, or the prevention of surface or ground water from reaching the soils by dams, levees, surface pumps, or other means. In these soils water table levels and/or their duration are changed significantly in connection with specific types of land use. Upon removal of the drainage practices, aquic conditions would return. In the keys, artificially-drained soils are included with soils that have aquic conditions.
- Elements of aquic conditions are as follows:
  - 1. Saturation is characterized by zero or positive pressure in the soil water and can generally be determined by observing free water in an unlined auger hole. Problems may arise, however, in clayey soils with peds, where an unlined auger hole may fill with water flowing along faces of peds while the soil matrix is and remains unsaturated (bypass flow). Such free water may incorrectly suggest the presence of a water table, while the actual water table occurs at greater depth. Use of well-sealed piezometers or tensiometers is therefore recommended for measuring saturation. Problems may still occur, however, if water runs into piezometer slits near the bottom of the piezometer hole, or if tensiometers with slowly-reacting manometers are used. The first problem can be overcome by using piezometers with smaller slits, and the second by using transducer tensiometry, which reacts faster than manometers.
  - Soils are considered wet if they have pressure heads greater than -1 kPa. Only macropores, such as cracks between peds or channels, are then filled with air while the soil matrix is usually still saturated. Obviously, exact measurements of the wet state can be obtained only with tensiometers. For operational purposes, the use of piezometers is recommended as a standard method. The duration of saturation required for creating aquic conditions varies, depending on the soil environment, and is not specified. (**NOTE: This is NOT saturation**)

What is Saturated? (Cont.)

- Three types of saturation are defined:
  - a. *Endosaturation.—The soil is saturated with water in all* layers from the upper boundary of saturation to a depth of 200 cm or more from the mineral soil surface.
  - b. *Episaturation.—The soil is saturated with water in one* or more layers within 200 cm of the mineral soil surface and also has one or more unsaturated layers, with an upper boundary above a depth of 200 cm, below the saturated layer. The zone of saturation, i.e., the water table, is perched on top of a relatively impermeable layer.
  - c. *Anthric saturation.—This term refers to a special kind* of aquic conditions that occurs in soils that are cultivated and irrigated (flood irrigation). Soils with anthraquic conditions must meet the requirements for aquic conditions and in addition have *both of the following:*
- (1) A tilled surface layer and a directly underlying slowly permeable layer that has, for 3 months or more in normal years, *both:*
  - (a) Saturation and reduction; *and*
  - (b) Chroma of 2 or less in the matrix; *and*
- (2) A subsurface horizon with *one or more of the* following:
  - (a) Redox depletions with a color value, moist, of 4 or more and chroma of 2 or less in macropores; *or*
  - (b) Redox concentrations of iron; *or*
  - (c) 2 times or more the amount of iron (by dithionite citrate) contained in the tilled surface layer.

What is Saturated? (Cont.)

- **Saturation in Engineering**
- **Pore water pressure** refers to the pressure of ground water held within a soil or rock, in gaps between particles (pores). Pore water pressures in below the phreatic level are measured in piezometers. The vertical pore water pressure distribution in aquifers can generally be assumed to be close to hydrostatic.
- In the unsaturated zone the pore pressure is determined by capillary pressure and is also referred to as tension, suction, or matric pressure. Pore water pressures under unsaturated conditions (unsaturated zone) are measured in with tensiometers. Tensiometers operate by allowing the pore water to come into equilibrium with a reference pressure indicator through a permeable ceramic cup placed in contact with the soil.
- Pore water pressure (sometimes abbreviated as *pwp*) is vital in calculating the stress state in the ground soil mechanics, from Terzaghi's expression for the effective stress of a soil .
- **Hydrostatic conditions**
- Water is drawn into a small tube by surface tension. Water pressure (u) is negative above and positive below the free water surface. If there is no pore water flow occurring in the soil, the pore water pressures will be hydrostatic. The water table is located at the depth where the water pressure is equal to the atmospheric pressure. For hydrostatic conditions, the water pressure increases linearly with depth below the water table:
- $u = \rho_w g z_w$ where ρ_w is the density of water, and z_w is the depth below the water table.

What is Saturation? (Cont.)

- **Capillary action**
- Water at particle contacts. Due to surface tension, water will rise up in a small capillary tube above a free surface of water. Likewise, water will rise up above the water table into the small pore spaces around the soil particles. In fact, the soil may be completely saturated for some distance above the water table. Above the height of capillary saturation, the soil may be wet but the water content will decrease with elevation. If the water in the capillary zone is not moving, the water pressure obeys the equation of hydrostatic equilibrium ($u = \rho_w g z_w$) but note that z_w is negative above the water table; hence, hydrostatic water pressures are negative above the water table. The thickness of the zone of capillary saturation depends on the pore size, but typically, the heights vary between a centimeter or so for coarse sand to 10's of meters for a silt or clay.
- **Intergranular contact force due to surface tension**
- The surface tension of water explains why the water does not drain out of a wet sand castle or a moist ball of clay. Negative water pressures make the water stick to the particles and pull the particles to each other, and friction at the particle contacts make a sand castle stable. But as soon as a wet sand castle is submerged below a free water surface, the negative pressures are lost and the castle collapses. Considering the effective stress equation, $\sigma' = \sigma - u$, if the water pressure is negative, the effective stress may be positive, even on a free surface (a surface where the total normal stress is zero). The negative pore pressure pulls the particles together and causes compressive particle-to-particle contact forces.
- Negative pore pressures in clayey soil can be much more powerful than those in sand. Negative pore pressures explain why clay soils shrink when they dry and swell as they are wetted. The swelling and shrinkage can cause major distress, especially to light structures and roads.

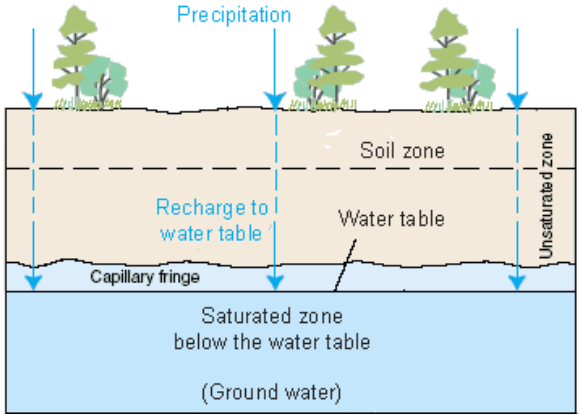
What is Unsaturated Zone Flow?

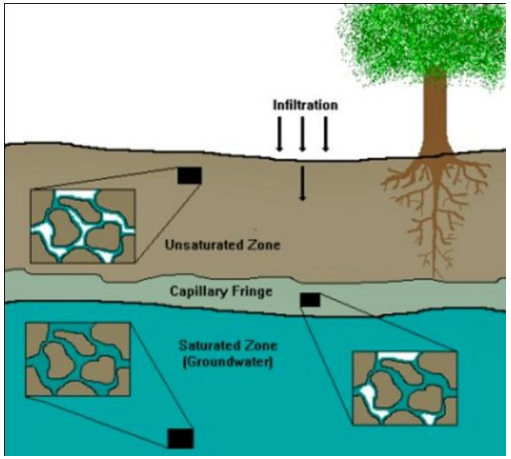
- Unsaturated zone flow is a function of infiltrating surface water. When precipitation, or other forms of surface water (e.g., storm water infiltration facilities, unlined storm water drainage ditches, artificial wetlands, etc.) infiltrate into soils and deposits, a complex interaction between the soil pores and gravity takes place, which also involves changes in pressure.
- The size of the pores, the infilling of the pores with fine materials, the shape of the pores, and the matrix of soils in the materials all affect what is called unsaturated hydraulic conductivity.
- In areas of low topographic relief, with no structural controls (such as faults, landslides, etc.), infiltrating water is generally vertical, but there can be preferential flows within the unsaturated zone, and there are MANY different types.
- The two simplest types (and those most often observed) are preferential flows and bypass flows. However, all are a function of infiltration in the unsaturated zone and are not ground water (or perched ground water).

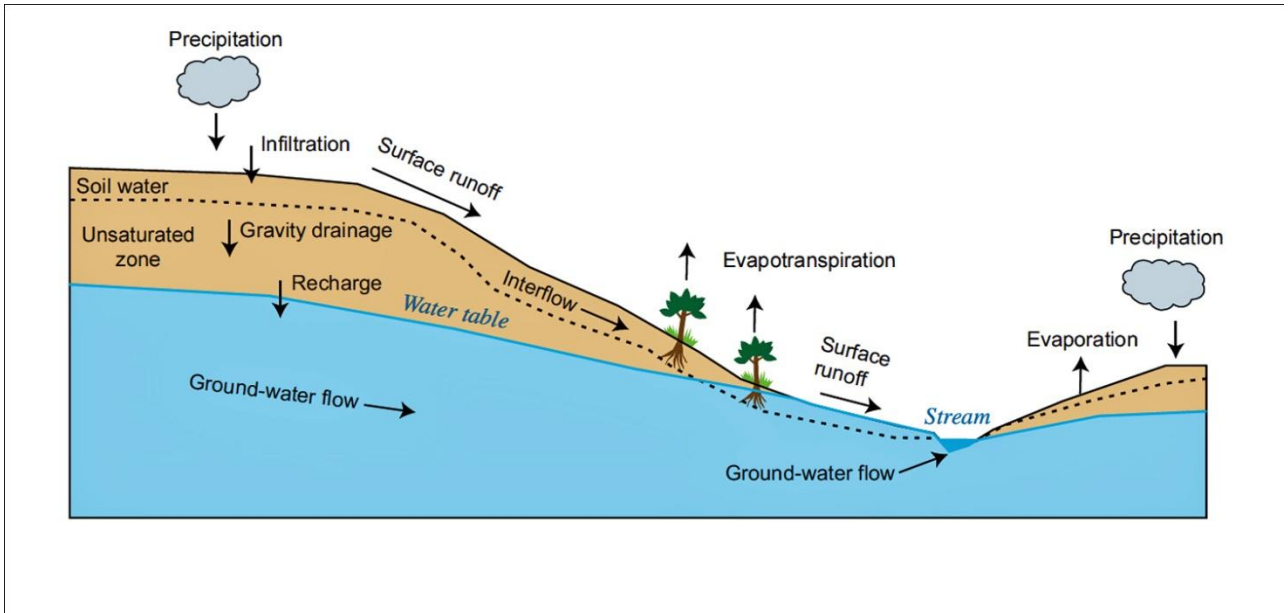
What is Unsaturated Zone Flow? (Cont.)

- The most common in the Puget Lowlands is preferential flows because of the topography and the glacial history of this area. Preferential flows are most common in areas where there is a slope greater than 1%, and where the soils or sediments have been deposited by water (which is the most common method for sediment deposition in the Puget Lowlands, and the second most common being glacially-laid till materials).
- When infiltrating water passing through a material with relatively-high hydraulic transmissivity encounters a material with lower hydraulic transmissivity, preferential flows are possible if there is a slope. However, at the same time downward infiltration is also occurring, at rates dependent on the hydraulic transmissivity of the deeper soil and the slope angle (the steeper the slope, the more likely the infiltrating water will follow the slope than infiltrate into the deeper sediments).
- As an example, if recessional outwash deposits are present as gravels and grade to sands, the gravels can have very high hydraulic transmissivity. Some are as high as several feet per second, but in this scenario we will assume that the infiltration rate is 1 cm/sec (equal to 2 feet per minute) which is a high infiltration rate, and that this material overlies a sand with 10^{-1} cm/sec (0.2 feet per minute). This is still very good hydraulic transmissivity compared to an aquitard such as cemented glacial till, which has a hydraulic transmissivity that ranges between 10^{-4} to 10^{-5} cm/sec.
- Even on a slight slope, the resistance in the upper aquifer is much less than the resistance to flow through the lower materials, and gravity will cause the infiltrating water to flow along the lower, highly-permeable soils simply because the upper soils are 10 times easier to flow through – but this is not a saturated flow, it is similar to a surface water flow – and therefore, not ground water.

Unsaturated Zone Flow v Ground Water Flow







Why Ecology was Wrong

- They delineated wetland areas in unlined, manmade drainage ditches, when they knew this was a violation of the GMA and SMA.
- They incorrectly determined that redoximorphic features were present and did not follow manual protocols for identifying these, nor did they follow the latest NTCHS methods for identifying these.
- They incorrectly identified wet sands as being saturated sands, and then immediately identified Munsell® colors for these sands, without making sure the sands were "moist".
- They determined that preferential/bypass flows were ground water when they were not, and were practicing hydrogeology without a license.
- They did not follow the protocols of the Manuals, including the NTCHS and the Corps Manuals; they did not describe the type of hydric soils they were identifying, nor did they conduct the level of study required to identify the type of hydric soils they were studying.
- They are challenging the findings of a licensed hydrogeologist (who conducted a comprehensive study) with an abbreviated, routine study that was not comprehensive enough to determine hydrology or to properly identify the soils. An unlicensed wetland scientist cannot challenge the findings of a licensed hydrogeologist.

Case Studies - Stream

- Stream – Port Orchard, WA
- The significant storms of December 2007 (and storms from 2006) had caused significant erosion damage to what the property owner believed to be a storm water conveyance, since the source water for this conveyance was two Kitsap County storm water culverts.
- During the winter of 2008 this conveyance was continuing to erode, and significant sediments were being transported to the outfall on Cool Creek, downgradient from the property.

Case Studies - Stream (Cont.)

- To address these erosion and sediment problems (that should have been addressed by Kitsap County for a storm water conveyance that is covered by the County's Municipal Storm Water NPDES permit) the property owner hired a firm to conduct emergency repairs on the storm water conveyance under the supervision of a CESCL inspector.
- These repairs included clearing the channel, stabilizing the banks of the conveyance, and the installation of netting to reduce erosion. They also included the removal of vegetation that was blocking the flow of storm water.

Case Studies - Stream (Cont.)

- These actions led to the State of Washington Department of Fish and Wildlife visiting the site and issuing a citation to the contractor conducting the work, and to the property owner for conducting grading activities on a type F stream without a hydraulic permit, and for incursions (including vegetation removal) within a type F stream setback.
- The WDFW biologist identified the conveyance as a natural stream with fish-bearing potential that forms a confluence with Cool Creek.

Case Studies - Stream (Cont.)

- Because of the citation, the property owner retained SNR to conduct a stream reconnaissance study to determine whether the water body on the property was a critical areas stream or a storm water conveyance.
- SNR studies on the property and off of the property used fluvial geomorphology to determine if the water body was a critical areas stream per the Kitsap County critical areas definition for a stream.

Case Studies - Stream (Cont.)

- These studies include a search for the headwater source(s), and follow the water body to the confluence/outfall of any other stream or conveyance (or storm water facility).
- These studies also include the visual interpretation of the channel, the bed, and other features of the water body associated with fluvial geomorphology.
- These studies include a reconnaissance of the areas, upgradient of the water body, to identify the source of the water body.

Case Studies - Stream (Cont.)

- SNR's studies found that there is no critical areas stream source for the surface water in the water body.
- The source of the surface water was determined to be the Kitsap County storm sewer system that served a large area to the northwest of the subject property.
- SNR also found that this storm water had been diverted onto the subject property without apparent easements, and that this storm water was not being treated as required by the Federal Clean Water Act, nor was it apparent that this discharge is covered under the Kitsap County Municipal Storm Water NPDES permit.

Case Studies - Stream (Cont.)

- SNR found that the water body on the subject property was a storm water conveyance carrying storm water derived from the Kitsap County storm water system to the northwest.
- SNR determined that the conveyance was completely manmade and that the channel was lined with imported cobbles that are not found on the subject property (as determined by over 25 test pits excavated on the subject property).

Case Studies - Stream (Cont.)

- The storm water conveyance was technically part of the Kitsap County storm water system that should have been permitted by Kitsap County and Kitsap County was responsible for the maintenance of this system per State and Federal law.
- WSDOT will be modifying the culvert system that discharges onto the subject property, and the storm water from the culverts will be connected to a tightline system that will be installed on the subject property to eliminate the erosion and sediment transport problems that have caused issues in the past. This system and the elimination of the stream status will allow up to 15 additional residential lots to be built on the subject property.

Case Studies - Stream (Cont.)

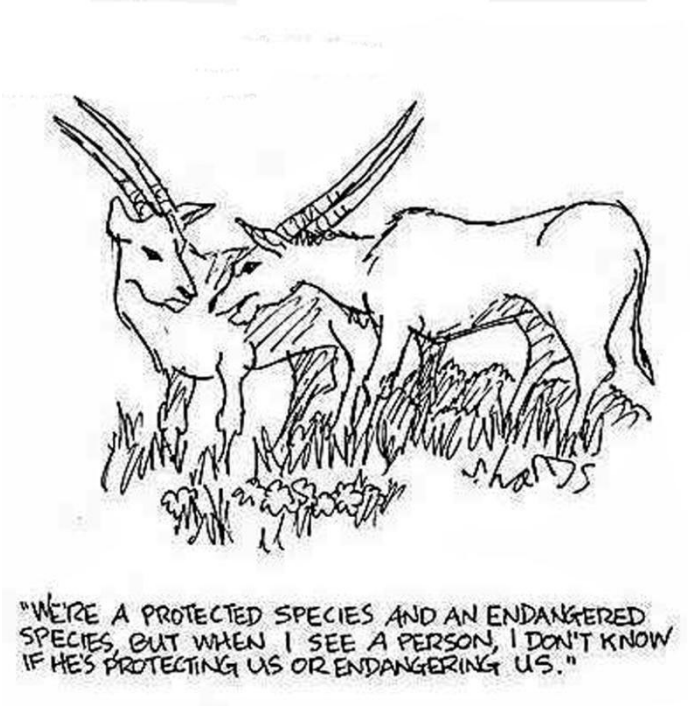
- One of the problems associated with streams is that many Counties and municipalities do not isolate storm water conveyances (point sources), as required by the Clean Water Act. They include all surface water bodies in their storm water system.
- Some Counties and municipalities regulate storm water conveyances as streams – if fish are observed in these manmade conveyances.
- This creates problems for the fish, and flooding problems, and was never intended by the CWA or the GMA.

Case Studies - Stream (Cont.)

- Encouraging fish to enter storm water conveyances and protecting these invaluable facilities as streams, defeats their purpose and endangers the fish.
- Native fish cannot survive nor can their fry survive in ephemeral storm water conveyances. The temperatures fluctuate too much, the dissolved oxygen is often too low, the salinity is usually too high, and the bottom of the channel rarely has the gravels required for nesting. Additionally, the water supply in storm water conveyances is not seasonal, it is ephemeral, which means the water can cease flowing any time there is a lull in precipitation. This can result in fish death, and the death of their eggs and fry.

Case Studies - Stream (Cont.)

- Storm water facilities must be separate systems with fish barriers at the outfalls to prevent native fish from entering these potential death traps.



Special Situations

- Storm water diverted onto the property
- County/City using private property for storm water detention purposes.
- Roads or other manmade features obstructing natural drainage or diverting storm water.
- 1990 “Rule” for roads and other obstructions.
- Diverted infiltrated storm water.
- Detention ponds on ridges above slopes.

Special Situations (Cont.)

- Nuisance water including utilities (water, sanitary sewer, and storm sewer).
- Infiltration ponds in areas of low topographic relief and in areas where glacial till is present near the ground surface.
- Osceola mudflow deposits
  - Storm water issues
  - Drainage issues
  - Ponding
  - NEVER infiltrate

Special Situations (Cont.)

- Influences from (Resource Conservation and Recovery Act) RCRA, (Treatment, Storage, and Disposal Facilities) TSDFs, and similar facilities.
- CERCLA (Superfund) sites
  - Potential ground water and surface water hazards
  - Other issues that can impact sites
- Landfills
  - Leachate and seeps creating hydrology

Special Situations (Cont.)

- Historic activities conducted on site, including storm water, grading, placement of fill materials, etc.
  - Almost all sites in the Puget Lowlands have been clear cut, resulting in the need for drainage ditches (and logging roads).
  - Impacts to hydrology can be significant.
  - Historic culverts may be damaged or purposely obstructed.
  - Grading and other activities on a site can create depressions and can block natural drainage.
  - Fill materials can include relict hydric soils or soils that can restrict drainage.

Special Situations (Cont.)

- Manmade ponds and ditches.
- Unintentional ponds (and those that are designed to not look like ponds) often by counties and municipalities.
- All manmade ponds must consider the hydrogeology and should be lined if infiltration is not advisable.
- All storm water ditches should be evaluated for potential infiltration-related problems (by a hydrogeologist) and either a line or tightline should be used if infiltration is not advisable.
- All storm water ditches should have fish barriers at their outfall unless it is impossible for fish to enter the ditch.
- Most storm water outfalls to navigable waters of the United States (and tributaries that create a significant nexus to these waters) must be permitted per the Clean Water Act.
- Storm water cannot be discharged to Category I wetland areas.

Special Situations (Cont.)

- Tile lines and other agricultural activities.
- Agricultural ditches must be maintained and cleared to keep tile lines open.
- Agricultural ditches must have fish barriers present if they have an outfall to fish-bearing streams.
- If near-surface ground water is an issue, agricultural ditches should be lined or tightlined.
- Historic agricultural drainage (and irrigation) ditches need to be properly classified, and must not be identified as streams or “creeks”.
- Irrigation facilities can affect ground water, and historic irrigation ditches are frequently classified by the WDFW as streams (erroneously).

Potential Ways to Deal with Critical Areas that have been Identified

- Mitigation
- New studies that determine smaller or no critical areas
- Hearing Examiner
- Growth Management Hearings Board
- Superior Court
- Variance
- Reasonable Use

Mitigation

- Buffer averaging
- Innovative design
- Onsite habitat enhancements
- Habitat restoration
- Offsite mitigation banking

New Studies

- If existing wetland studies are erroneous due to misinterpretation of soils or hydrology (or vegetation), additional studies using geologists, hydrogeologists, or soil scientists may provide more accurate findings and may reduce or eliminate previously-identified wetland areas.
- If the hydrology has changed, new wetland studies may find that wetland areas have also changed, or are no longer supporting wetland conditions.

Hearing Examiner

- If a wetland delineation is not accepted by the City or County (Director, or his/her assignees), this can be challenged at a hearing with the Hearing Examiner.
- These are quasi judicial hearings, usually requiring a competent land use attorney for representation.
- This process may be skipped in lieu of the court system, which generally means that the case is held in the Superior Court. However, if the wetland area has a significant nexus with navigable waters of the United States or tributaries to these waters, other actions may be required, and if a hearing is required, it will most likely be in Federal court.

Superior Court (State Court)

- Requires representation by a good, well-versed, land use attorney.
- Can address any Critical Areas issues where there is a dispute regarding the presence of critical areas or impacts from critical areas.
- Often, the only way to address unconstitutional taking of land by governmental agencies (without compensation), and can address interpretation of a Police Power.
- Often, the only way to address illegal diversion of storm water onto a property.
- May require a hearing in Federal Court if the USACE or USEPA is involved.

Variance(s)

- Can provide methods to obtain more usable space when critical areas buffers impact development.
- Can be used under certain circumstances to obtain conditional uses of buffers and setbacks.
- Can usually be used when discretionary power has been granted to the “Administrator”.
- Sometimes conditional or special use permits can be used instead.

Reasonable Use

- The GMA does not allow a properly-plated property to be prohibited from development without compensation.
- All properly-plated properties can be developed, even if critical areas or buffers are present that would normally preclude development.
- May need approval from the Hearing Examiner.
- Development will be allowed if the following are met:
  - The project includes compensatory mitigation for unavoidable sensitive area and buffer impacts, in accordance with the mitigation requirements;
  - The proposed activities will not result in adverse effects on endangered or threatened species, as listed by the federal government or the State of Washington, or be inconsistent with an adopted recovery plan;
  - The proposed activities will not result in damage to nearby public or private property, and are not a threat to the health or safety of people on or off the site;
  - The proposed activities will not lead to degradation of groundwater or surface water quality and will comply with all State, local, and Federal laws, including those related to sediment control, pollution control, floodplain restrictions, and on-site wastewater disposal.

Citizen's Lawsuits

- Especially useful when municipal storm water has been diverted onto private property, or the municipality is using private property to store storm water.
- Useful when storm water conveyances and drainage ditches have been identified as streams by the municipality.
- Useful in flooding situations where storm water conveyances, ditches, and other facilities have been determined to be natural features, and can no longer be maintained.
- Can be useful when a municipality is using a pond or lake as part of their water detention system.
- Many other uses, and they are a proven method for suing municipalities that are not in compliance with any regulation that is in Title 40 of the Code of Federal Regulations - including the Clean Water Act, the Endangered Species Act, and other Federal regulations.
- Have successfully been used for over 30 years by environmentalists, and are now being applied to property owners' rights issues.

Summary

- We are running out of easily-developable land.
- The land that is available may have critical areas (or may appear to have critical areas) and may be receiving storm water from many different sources.
- There are three types of Critical Areas:
  - Ecological
  - Geologic Hazards
  - Environmental

Summary (Cont.)

- The shorelines are regulated by the Shoreline Management Act, NOT the Growth Management Act Critical Areas.
- Some of the Critical Areas ordinances overlap Federal regulations; if the property is regulated by the Clean Water Act, the Federal regulations will apply.
- Critical Areas ordinances can regulate isolated wetland areas.
- There are other State and Federal regulations that have different impacts on development, some of which can conflict (e.g., storm water erosion and sediment control, and hydraulic approval permits).

Summary (Cont.)

- Some County and Municipal ordinances have conflicts with the Critical Areas ordinance, especially the storm water regulations.
- Some Counties and Cities have modified their Critical Areas ordinances, requiring ecological mitigation for geologic hazards, making any channelized water body a stream, and extending shorelines to include all wetlands (combining shoreline regulations and critical areas regulations is disallowed by the court).

Summary (Cont.)

- When a Critical Areas study is requested by the County or Municipality, choosing the right firm to conduct the study is paramount. Incorrectly identified and delineated critical areas can be costly.
- Do not choose a firm based on price – make a choice based on qualifications and references.
- Remember that the initial cost of the investigation can only be the beginning, if critical areas are determined to be present, especially ecological critical areas.
- Mitigation plans, the loss of use of the identified critical areas and ancillary buffers, and the monitoring for any mitigation are additional costs that go way beyond the cost of the initial investigation.

Summary (Cont.)

- Make sure that who you hire to conduct these studies is objective, qualified, and can competently identify soils and hydrology as well as vegetation.
- Avoid firms that base wetland identification and delineations primarily on vegetation, and make sure those doing the study have the qualifications to conduct soils and hydrology/ground water studies.
- Do not rely on County and City approved consultant lists, these do not imply that the firms are qualified to conduct these studies.
- Make sure that the firm conducting these studies has the appropriate licenses to conduct the studies (as required by State law).

Questions?

- Questions…