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Appeal of Lewis County Development Department's Threshold Determination of Nonsignificance Under State Environmental Policy Act For Permit Application No. WCF25-0002/SEP25-0021

Date: September 12, 2025

DELIVERED VIA EMAIL: Katie.johnson@lewiscountywa.gov

To: Hearing Examiner
Re: Appeal of Lewis County Community Development Department's State Environmental Policy Act Threshold Determination of Nonsignificance for Permit No. WCF25-0002/SEP25-0021, Type III Application for a proposed 150-foot monopole tower at 262 Skyview Drive, Mossyrock, WA 98564

Dear Hearing Examiner,

Petitioner, Lewis County for Safe Technology is a grassroots group of local residents,[1] collectively appealing Lewis County Community Development ("Community Development") threshold determination of a Determination of Nonsignificance ("DNS") to Permit No. WCF25-0002/SEP25-0021, a Type III Wireless Communication Facilities Application ("Project"). Petitioner requested that this firm prepare and submit this appeal on their behalf, and request that this appeal be placed in the record for the public hearing that has yet to be scheduled.

I. INTRODUCTION AND PROCEDURAL HISTORY

The Project is a proposed 150-foot monopole tower to be installed and operated on an undeveloped parcel located at 262 Skyview Dr., Mossyrock, Washington 98564.

[1] Individual members include residents who own adjacent parcels to the parcel where the proposed Project is located. As such LCST can establish standing as a party representing the interests of the abutters who will be injured without proper review under SEPA. *See*. *Magnolia Neighborhood Planning Council v. City of Seattle,* 155 Wn. App. 305, 230 P.3d 190, 2010 Wash. App. LEXIS 636 (Wash. Ct. App. 2010), amended, No. 63466-6-I, 2010 Wash. App. LEXIS 1098 (Wash. Ct. App. Mar. 29, 2010).

Petitioner is concerned about the potential significant environmental impacts on endangered and threatened species in the area and other wildlife and ecological habitats. Petitioner seeks to ensure all required reviews under the Washington State Environmental Policy Act ("SEPA") are properly conducted.

A DNS threshold determination is a finding that a Project does not require an Environmental Impact Statement ("EIS") because there is no "probable, significant adverse impact on the environment," DNS, dated August 21, 2025. If allowed to stand, this threshold determination precludes any future environmental review, leaving LCST and other members of the public without any meaningful way to assess the full environmental impacts on their interests. LSCT is aggrieved by the DNS threshold determination made by the responsible official and thereby, on behalf of its affected members, exercise the right to appeal this determination per LCC Section 117.110.130(1).

Harmoni Towers ("Applicant") submitted its permit application to Lewis County ("County") on July 18, 2025. On August 11, 2025, the County deemed the application complete and posted a Notice of Application on August 21, 2025. Community Development, as the lead agency for the Project proposal, issued the DNS threshold determination for environmental review pursuant to SEPA requirements of Washington State Environmental Policy Act ("SEPA") RCW 43.21C *et seq*. on August 21, 2025. Exh. 1 DNS Threshold Determination. Written public comments on the Project were due September 5, 2025 and Petitioner submitted written public comments opposing the Project on several grounds, including the visual and aesthetic impact on scenic views of nature, devaluation of property values, and inadequate SEPA review. Given the Project's location in a rural district, on an undeveloped parcel, in an area where endangered and threatened species and migratory birds are known to exist, Petitioner urges the hearing examiner to overturn the DNS.

II. LEGAL ARGUMENT

The DNS implicitly accepts that there are no applicable exemptions or exceptions that would dispense any requirement for SEPA evaluations. For example, the exemption in RCW 43.21C.0384 (relating to wireless services facilities) does not apply since the proposed project is not for collocation, the tower is more than 60 feet in height and it is not located in a commercial, industrial, manufacturing, forest, or agricultural zone. The responsible official correctly recognized that a threshold determination of adverse impact was necessary. Petitioner, however, denies that this project should be deemed to not have a probable significant adverse impact under WAC 197-11-340 and LCC 197-11-340. This is so for three reasons. First, the applicant failed to provide all the information that is required in the environmental checklist. Second, some of the representations are incorrect

or misleading. Third, the information that is provided and the factual material provided herein clearly show there will be significant adverse impacts that must be addressed and, at minimum, mitigated. The project requires a DS under LCC 197-11-360 rather than a DNS. In the alternative, mitigation steps are necessary and at minimum a mitigated DNS under LCC 197-11-350 is required.

The circumstances of this Project do not warrant a DNS ending a thorough environmental review that would generate an Environmental Impact Statement ("EIS") or at least a Mitigated DNS. An EIS would contain important information that permitting authorities and the public can review to assess the extent of environmental harm that could result from the Project. Precluding such review undermines Washington State and Lewis County policies intended to preserve the rural character of the Project's location and advance the legislature's declaration of purpose in SEPA.[2] The application materials the responsible official purported to review are incomplete, because of missing (and incorrect) representations and documentation about wildlife and sensitive habitats. The responses to the SEPA Checklist on which Community Development relied upon to issue the DNS are generalized and conclusory, falling far short of the specificity state case law requires. Therefore, the hearing examiner should reverse the DNS, require that more information be provided in the Checklist response, and further mandate that an EIS be performed or, in the alternative, that the responsible official assess mitigation steps that would be sufficient to support a mitigated DNS. *See*, LCC 2.25-130.12(b).

A. The Content of Applicant's SEPA Checklist Responses Are Incomplete

The County adopts its Environmental Policy Chapter under SEPA and the SEPA rules. LLC 17.110.020. The County's basic requirements for SEPA compliance mirror that of the Washington Administrative Code and incorporate these by reference. LLC 17.110.030.

WAC 197-11-060 provides comprehensive details regarding the content of environmental review. Lead agencies must consider the wide-ranging impacts of a Project beyond local and state geographical boundaries, *Id.* (b). "Agencies shall carefully consider the range of probable impacts, including short-term and long-term effects.

[2] *See* RCW 43.21C.010:

> The purposes of this chapter are: (1) To declare a state policy which will encourage productive and enjoyable harmony between humankind and the environment; (2) to promote efforts which will prevent or eliminate damage to the environment and biosphere; (3) and [to] stimulate the health and welfare of human beings; and (4) to enrich the understanding of the ecological systems and natural resources important to the state and nation.

Impacts shall include those that are likely to arise or exist over the lifetime of a proposal or, depending on the particular proposal, longer. *Id.* (c).

This rule also addresses the effects of development caused by a Project that lead agencies must include in the SEPA process:

> (d) A proposal's effects include direct and indirect impacts caused by a proposal. Impacts include those effects resulting from growth caused by a proposal, as well as the likelihood that the present proposal will serve as a precedent for future actions. For example, adoption of a zoning ordinance will encourage or tend to cause particular types of projects or extension of sewer lines would tend to encourage development in previously unsewered areas.

Several items in the SEPA checklist ask about impacts that are likely to arise or exist over the lifetime of the Project. These are as follows with Applicant's responses:

> Item B.1.f **Could erosion occur because of clearing, construction, or use? If so, generally describe.**
>
> No erosion is anticipated. Exh. 2 Environmental Checklist p. 4.
>
> Item B.3.d **Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:**
>
> No significant surface or ground water impact anticipated. Consequently, no reduction measures are required. *Id.* p. 6
>
> Item B5.d **Proposed measures needed to preserve or enhance wildlife, if any.**
>
> None needed *Id.* p. 7
>
> Item B7.4 **Describe special emergency services that might be required.**
>
> None required. *Id.* p. 9 [Emphasis in original].

These responses are conclusory and are not substantiated by supporting facts. They are also belied by other parts of the application, including the limited design information that was provided.

In *King County v. Friends of Sammamish Valley*, 3 Wn.3d 793 (2024), the court found that King County's DNS determination checklist that did not address any potential environmental impacts to be one of two dispositive factors in its holding that Central Puget Sound Growth Management Hearings Board ("Board") did not err in its finding that an ordinance violated Washington State's Growth Management Act. *Id.* There, the Board's "order noted that the checklist was inadequate because it did not contain

reasonably sufficient information about environmental effects in this agricultural area to support the DNS…" *Id.* at 820.

In the same way, the applicant's Checklist response contents do not contain complete or correct information about the environmental effects of the proposed monopole on an undeveloped parcel in a low-density rural area.[3] Of note, which bears repeating, is Applicant's response to Item B5.d is "[n]one needed" to the question regarding any "proposed measures needed to preserve or enhance wildlife." Exh. 2 p. 7. This response may be adequate in a more developed, urban or suburban district where the extent of wildlife is limited to rabbits, squirrels, pigeons, seagulls and other well-adapted species that live in densely populated areas. It is not adequate in a location with a pristine and rich natural setting frequented by the Gray Wolf, an endangered species. U.S. Fish and Wildlife Service, IPaC Resource List, https://ipac.ecosphere.fws.gov/location/TETOO4VTEFGPTJ7ZSNEBQFK6ZU/resources, (accessed September 8, 2024.) Exh. 3 USFWS IPaC Resource, p. 4.

Furthermore, "proposed land-use related actions, such as zoning ordinances, are not insulated from full environmental review simply because there are no existing specific proposals to develop the land in question or because there are no immediate land use changes which will flow from the proposed action. *Id.* at 816 (citing *Wash. State Boundary*, 122 Wn.2d 648, 664.) This case, as opposed to *King County*, involves a specific proposal to develop the land with the construction and operation of a 150-foot tall monopole. Construction activities will involve filling and grading, "requiring the removal of all vegetation, topsoil, debris, wet and unsatisfactory soil materials…" Exh. 5 WCF25-0002 Plans Sheet, GN.10. The site will include an "impervious surface…of crushed washed gravel within the 50' x 50' fenced area and the improvement of the existing access." Exh. 2, p. 4.

SEPA mandates detailed information in environmental checklist submissions and requires that the responsible official meaningfully and objectively assess the potential for environmental damage to areas from development projects. *Conserv. Nw. v. Okanogan County*, 2016 Wash. App. LEXIS 1410, 89. (citing *Spokane County v. Eastern Washington Growth Management Hearing Board,* 176 Wn. App. 555 (2013)). Broad generalizations and formulaic language "assuming compliance with applicable standards" indicates a failure to "fully disclose and carefully consider" environmental impacts. *Id.* at 89-90.

[3] The parcel is zoned RDD-5. RDD, or Rural Development District, is intended to "protect the rural character and rural small businesses that historically have served Lewis County residents." *See* LCC 17.100.010.

State law and case precedent requires thorough and detailed responses in a SEPA Checklist but Applicant's responses are formulaic, conclusory, cursory and inconsistent with other parts of the application. Applicant's response to Checklist Item B.1.e is representative:

> **e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.**
>
> Minimal leveling is required for construction and access. The graveled fenced area is approximately 2500 square feet. Exh. 2, p. 4 [emphasis in original].

B. Applicant's Responses to the SEPA Checklist Fail to Mention Endangered and Threatened Species Potentially Impacted and Nearby Areas of Ecological Concern.

The principal purpose of SEPA is to provide decision makers and the public with information about potential adverse impacts of a proposed action. *Glasser v. City of Seattle, Office of Hearing Exam'r*, 139 Wn. App. 728, 736 (2007) (citing *Save Our Rural Env't v. Snohomish County*, 99 Wn.2d 363, 373, 662 P.2d 816 (1983). "Endangered" means a species which is seriously threatened with extirpation throughout all or a significant portion of its range within Washington. WAC 220-610-00 4.4 "Threatened" means a species that could become endangered within Washington without active management or removal of threats. *Id.* 4.14. WAC 220-610-010 designates 36 state-endangered species.

A 2015 State Wildlife Action Plan lists species with greater conservation needs throughout Washington State and their association with fragile ecological habitats, or ecological systems of concern ("ESOC"). Exh. 4 SWAP 2015, p. 4-5.Willamette Valley Wet Prairie is a nearby ESOC close to Mossyrock that has "nearly been extirpated in Washington." State Wildlife Action Plan, p. 4-52. This ESOC includes small patches of habitat in Lewis County. *Id.* There are species with greater conservation needs closely associated with this ecological system, including mammals such as the Silver-haired bat, Pocket Gopher, and birds, the Bald Eagle[4] and Streak-Horned Lark. *Id.*

[4] Protecting bald eagles is a priority in Washington. RCW 77.12.650 mandates cooperation with "local, state, and federal agencies and governments to protect bald eagles and their essential habitats through existing governmental programs, including but not limited to:

> 1) The natural heritage program managed by the department of natural resources under chapter 79.70 RCW;

Project applicants must complete a thorough environmental checklist under SEPA rules. *Conserv. Nw. v. Okanogan County,* 2016 Wash. App. LEXIS 1410, 2. In that case, which involved an ordinance to allow the use of all-terrain vehicles, or ATVs, on certain roads. In its environmental checklist, Okanogan County proposed no measures to reduce environmental impact, writing that "the ordinance would cause little, if any, increase in the use of Okanogan County roadways. *Id.* at 10. The County also "failed to list any of the principal fauna and fora in the area and omitted any reference to endangered or threatened species, other than to mention that mule deer used the region as a migratory route." *Id.* These cursory responses and failure to list endangered and threatened species in the environment factored in the court's finding of no rational basis to assume the damage from ATV use would be minimal. *Id.* at 17-18.

Applicant's cursory and incomplete responses regarding proposed measures to mitigate environmental impacts and list endangered and threatened species are almost verbatim to Okanogan County's responses in its environmental checklist.[5] All of these species should have been included in Applicant's Checklist however, the Checklist only references two species, Rocky Mountain Elk and Riverine. Exh 2., p. 7. The statements regarding no known or identified or observed threatened or endangered species or wildlife habitats are inaccurate and incomplete.

Overall, Applicant's responses indicate that very little observation of the site's ecological aspects took place. It is clearly the result of perfunctory efforts and is wholly inadequate in both scope and underlying factual material.The site's rural location, by its nature (absent any toxic conditions or wildlife disease outbreak), would generate at least several sightings of sparrows, maybe rabbits or rodents, and common insects. Applicant does not bother to list specific animal or bird species in its response to Item 5.a. Only "songbirds," listed as an example of "any birds and other animals that have been observed on or near the site or are known to be on or near the site" is circled. *Id.* Surely deer are at least known to be near the site but Applicant fails to list deer or any other animals.

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(2) The natural area preserve program managed by the department of natural resources under chapter 79.70 RCW;

(3) The shoreline management master programs adopted by local governments and approved by the department of ecology under chapter 90.58 RCW.

[5] It bears noting that Okanogan County also failed to do any surveying or mapping to determine what vulnerable species would be impacted by ATV use. *Okanogan County,* App. LEXIS 1410 at 17. In a similar fashion, Applicant also provides no survey or mapping of vulnerable species that might inhabit the Project area.

C. The Checklist Materials are Incomplete

LLC 17.110.110(2) places the burden on the County to require applicants to complete the environmental checklist while "providing assistance as necessary" for private proposals. The lead agency may take one or more of the following actions if, after reviewing the checklist, the agency concludes there is insufficient information to make its threshold determination:

> (1) Require an applicant to submit more information on subjects in the checklist;
> (2) Make its own further study, including physical investigations on a proposed site;
> (3) Consult with other agencies, requesting information on the proposal's potential impacts which lie within the other agencies' jurisdiction or expertise (agencies shall respond in accordance with WAC 197-11-550); or
> (4) Decide that all or part of the action or its impacts are not sufficiently definite to allow environmental analysis and commit to timely, subsequent environmental analysis, consistent with WAC 197-11-055 through 197-11-070. WAC 197-11-335

Several documents and reports are missing in the application materials but there's no indication the County took any of the above steps to or made any effort to obtain these materials.[6] Item A.8 asks Applicant to list "any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal." Exh. 2, p. 2. Applicant's response lists two items: "Phase 1 report" and "NEPA." Neither item indicates anything about the environmental information, nor indicates whether the environmental information has already been prepared or will be prepared in the future for the Project. *Id.* "NEPA" presumably refers to required federal environmental reviews but provides no information on whether this environmental review has taken place.[7] In addition, "Phase 1 report" seemingly contradicts Applicant's "Construction 2026/no phasing" response to the above Item A.6 that requests the "[p]roposed timing of schedule (include phasing if applicable)." *Id.* The Checklist mentions a "Washington Fish and Wildlife Priority Habitats and Species Report dated 4/29/25" but no such report is included. *Id.*, p. 7.

[6] The County seems not to have noticed the missing documents and reports in its issuance of the DNS even while basing this decision "made after review by Lewis County of a completed environmental checklist and other information on file with this agency…" DNS.
[7] National Environmental Policy Act of 1969, § 42 U.S.C. 1431

D. A DNS Determination for this Project Undermines Washington State Policy to Protect the Environment and Preserve Rural Lands

The Washington Legislature has expressed its clear intent to strongly promote environmental protection and preserve rural lands with two comprehensive legislative frameworks, SEPA and the Growth Management Act ("GMA"). As discussed above, SEPA's regulatory framework[8] ensures that proposed projects undergo a rigorous environmental review process to ensure that all projects, including projects regarding proposed land-use law changes that do not directly impact the physical land, such as rezoning ordinances, are carried out in a manner to minimize adverse environmental impacts. GMA directs cities and counties to manage population growth in accordance with policy goals that include protecting the environment, maintaining natural resources, and encouraging the involvement of citizens. RCW 36.70A.20(8),(10),(11). Some counties are not required to "fully plan" under the GMA but Lewis County is not one of these counties.[9]

GMA recognizes "the importance of rural lands and rural character to Washington's economy, its people, and its environment, while respecting regional differences. Rural lands and rural-based economies enhance the economic desirability of the state, help to preserve traditional economic activities, and contribute to the state's overall quality of life. RCW 36.70A.011. Indeed, GMA mandates that all counties

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[8] SEPAs' policies expressly recognize the "profound" impact of development and industrial expansion, urbanization, population growth, resource use and exploitation, and the critical importance of restoring and maintaining environmental quality to the overall welfare and development of human beings…RCW 43.21C.020(1). SEPA's goals are:

> (a) Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
>
> (b) Assure for all people of Washington safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
>
> (c) Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
>
> (d) Preserve important historic, cultural, and natural aspects of our national heritage;
>
> (e) Maintain, wherever possible, an environment which supports diversity and variety of individual choice;
>
> (f) Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and
>
> (g) Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources. *Id.*

[9] *See* https://mrsc.org/explore-topics/planning/gma/growth-management-act-basics (accessed September 12, 2025) The Municipal Research and Services Center (MRSC) depicts a colored map showing the counties required to fully plan under the GMA.

include a rural element including lands that are not designated for urban growth, agriculture, forest, or mineral resources. RCW 36.70A.070(5).

GMA outlines specific measures governing rural development that all counties must follow:

> (i) Containing or otherwise controlling rural development;
> (ii) *Assuring visual compatibility of rural development with the surrounding rural area;*
> (iii) Reducing the inappropriate conversion of undeveloped land into sprawling, low-density development in the rural area;
> (iv) *Protecting critical areas, as provided in RCW 36.70A.060, and surface water and groundwater resources;* and
> (v) Protecting against conflicts with the use of agricultural, forest, and mineral resource lands designated under RCW 36.70A.170. [Emphasis added.]

Assuring the visual compatibility of proposed rural development with the surrounding areas goes hand-in-hand with protecting critical areas and the environment. Projects, especially those that will alter the physical characteristics of the land, inevitably visually alter the land and the surrounding areas. The Project parcel in this case is an undeveloped parcel. Aside from a gravel access road to the parcel, the land remains in its natural state of grass, shrubs, evergreen trees, and sloping hills under open sky, untouched by signs of human habitation. On that parcel, wildlife exists mostly unspoiled and free.

The DNS in this case excuses Applicant from submitting an EIS that would provide specific information on the adverse impacts that are likely to occur from the construction and operation of a tall, steel 150-foot monopole tower on this parcel. The visual incompatibility of an industrial structure is in itself a form of environmental damage, one that will be permanent and enduring for as long as the tower remains in place. Furthermore, the placement of the tower on this parcel opens the door to further development and the encroachment of additional structures that will degrade the visual and aesthetic quality of the area.

The DNS entirely fails to assure the visual compatibility of rural development with the surrounding area. This outcome excuses Applicant from having to submit an EIS, a document containing detailed information about the adverse impacts and removes a key step in the environmental review process requirement for Applicant to submit an EIS with information for reviewing authorities and the public to assess. Nor does it, at minimum, require consideration of alternatives or other mitigating steps that would address and eliminate the adverse impacts demonstrated by the application itself.

Conclusion

The responsible official shall reconsider the DNS based on timely comments and may retain or modify the DNS or, if the responsible official determines that significant adverse impacts are likely, withdraw the DNS or supporting documents. When a DNS is modified, the lead agency shall send the modified DNS to agencies with jurisdiction. WAC 197-11-340(f).

The hearing examiner can overturn the proposed DNS and mandate that proper and full information be provided and further evaluation be performed to determine whether an EIS, or at minimum, whether alternatives exist or mitigating steps can be taken that will support a mitigated DNS.

Lewis County does have a goal of "promoting the development of a high-quality telecommunications network." CF 16. Comprehensive Plan, Vol 1, p. 80. But that goal must be accomplished consistent with SEPA and other procedural and substantive mandates. Doing so assures Petitioner that the County is properly regulating the placement of towers and other wireless facilities to minimize the potential adverse impacts on public welfare and safety, rural small businesses, property values, scenic vistas, and the overall community character. *See Id* CF 16.2.

Applicant has not provided sufficient evidence to justify a DNS. The record does not support one, especially considering the evidence submitted herein by LCST that addresses several mandatory criteria and substantive requirements. The hearing examiner must reverse the DNS, require that more information be provided in the Checklist response, and further mandate that an EIS be performed or, in the alternative, that the responsible official assess mitigation steps that would be sufficient to support a mitigated DNS. *See*, LCC 2.25-130.12(b).

We appreciate the opportunity to make this submission and look forward to further developing the record through written and oral comments at the hearing.

Respectfully Submitted,

McCollough Law Firm PC
By: W. Scott McCollough

Exhibit 1

LEWIS COUNTY – STATE ENVIRONMENTAL POLICY ACT
THRESHOLD DETERMINATION
DETERMINATION OF NONSIGNIFICANCE (DNS)

LEAD AGENCY: Lewis County – Community Development Department

PROPONENT: Harmoni Towers (Verizon), Bill North (North Group)

FILE NUMBERS: SEP25-0021

DESCRIPTION OF PROPOSAL: Verizon Wireless proposes to construct a new 150 foot monopole tower with attached antennas and cabling along with ground mounted equipment cabinets placed within a 50x50 foot fenced area. The facility will be served by a 20 foot wide access road and utility connections.

LOCATION OF PROPOSAL: The project is located at 262 Skyview Dr. Lewis County, WA – Section 12, Township 12 N, Range 02 E, WM on parcel number 028513011000

THRESHOLD DETERMINATION:
The lead agency for this proposal has determined that it does not have a probable, significant adverse impact on the environment. An environmental impact statement (EIS) is NOT required under RCW 43.21C.030(2)(c). This decision was made after review by Lewis County of a completed environmental checklist and other information on file with this agency and such information is adopted herein by reference. This information is available electronically here https://lewiscountywa.gov/departments/community-development/current-planning-applications/

This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for 14 days from the issue date below. The comment period begins on the date of issuance and written comments must be submitted by **4pm on September 5, 2025**

Responsible Official: **Mindy Brooks, Director**
Lewis County Community Development
125 NW Chehalis Ave
Chehalis, Washington 98532

Contact Person: **Preston Pinkston, Planner**

for Responsible Official

Date of Issue: **August 21, 2025**

*This SEPA determination may be appealed in writing to the Lewis County Hearings Examiner until 4 pm on **September 12, 2025** at the Lewis County Community Development Permit Center. Appellants should be prepared to make **specific factual objections**. The appeal procedure is established in Lewis County Code (LCC) Section 17.110.130 and LCC Section 2.25.130. The administrative appeal fee is established by Resolution of the Board of County Commissioners. The current adopted fee schedule is available online at https://lewiscountywa.gov/departments/community-development/permit-applications-and-handouts/.*

Exhibit 2

Exhibit D

SEPA[1] Environmental Checklist

Purpose of checklist

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization, or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. **You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown.** You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to **all parts of your proposal**, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for lead agencies

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B, plus the Supplemental Sheet for Nonproject Actions (Part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in "Part B: Environmental Elements" that do not contribute meaningfully to the analysis of the proposal.

[1] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/Checklist-guidance

A. Background

Find help answering background questions[2]

1. **Name of proposed project, if applicable:**

   Mossyrock

2. **Name of applicant:**

   Harmoni Towers/Verizon Wireless

3. **Address and phone number of applicant and contact person:**

   HARMONI TOWERS

   6210 Ardrey Kell Rd

   Charlotte, NC 28277

   Bill North 425-876-2909

4. **Date checklist prepared:**

   5/7/2025

5. **Agency requesting checklist:**

   Lewis County

6. **Proposed timing of schedule (including phasing, if applicable):**

   Construction 2026 / no phasing

7. **Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.**

   No Future activity is included in this proposal or anticipated at this time

8. **List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.**

   Phase 1 report

   NEPA

9. **Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.**

   No

10. **List any government approvals or permits that will be needed for your proposal, if known.**

    SEPA Determination

    WCF Type III approval

    Building Permit

[2] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-A-Background

11. **Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)**

    The proposed facility will consist of a newly constructed 150' monopole with 12 panel antenna mounted at 150' and microwave dish along with equipment cabinets and emergency generator placed within a 50' x 50' secured fenced area.

12. **Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.**

    The address of the site is:

    262 SKYVIEW DR MOSSYROCK, WA 98564

B. Environmental Elements

1. Earth

Find help answering earth questions[3]

a. **General description of the site:**

Circle or highlight one: Flat, rolling, hilly, steep slopes, mountainous, other:

b. **What is the steepest slope on the site (approximate percent slope)?**

    There are no slopes within the immediate area of the proposed site. There are slopes on the perimeter of the property in areas that are approximately 40%.

c. **What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them, and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.**

[3] https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-earth

Clay, sand, and gravel. No agricultural soils.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

No

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

Minimal leveling is required for construction and access. The graveled fenced area is approximately 2500 square feet.

f. Could erosion occur because of clearing, construction, or use? If so, generally describe.

No erosion is anticipated

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

The property is currently undeveloped with existing gravel drive access. The site will include less than 5000 square feet of impervious surface consisting of the proposed crushed washed gravel within the 50'x 50' fenced area and the improvement of the existing access.

Proposed measures to reduce or control erosion, or other impacts to the earth, if any.

None anticipated

2. Air

Find help answering air questions[4]

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

Temporary minor emissions will result from equipment during the construction phase. Construction practices will comply with applicable air quality regulations. Upon completion, normal vehicular traffic emissions will occur as a result of monthly maintenance visits to the facility.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

No

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

No emissions generated; hence no reduction measures are required.

[4] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-Air

3. Water

Find help answering water questions[5]

a. Surface:

Find help answering surface water questions[6]

1. **Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.**

   Yes. Lake Mayfield Reservoir which was created by Mayfield Dam on the Cowlitz River approximately 2300' to the north.

2. **Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.**

   No

3. **Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.**

   Not applicable

4. **Will the proposal require surface water withdrawals or diversions? Give a general description, purpose, and approximate quantities if known.**

   No

5. **Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.**

   No

6. **Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.**

   No

b. Ground:

Find help answering ground water questions[7]

1. **Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate**

[5] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-3-Water
[6] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-3-Water/Environmental-elements-Surface-water
[7] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-3-Water/Environmental-elements-Groundwater

quantities withdrawn from the well. Will water be discharged to groundwater? Give a general description, purpose, and approximate quantities if known.

No water will be drawn or discharged.

2. **Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (domestic sewage; industrial, containing the following chemicals…; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.**

No waste material will be generated or discharged at this site.

c. Water Runoff (including stormwater):

1. **Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

A negligible amount of storm water runoff will result from the added crushed ground gravel included in this proposal.

2. **Could waste materials enter ground or surface waters? If so, generally describe.**

No waste materials will be generated on the proposed site.

3. **Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.**

No drainage patterns will be affected.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

No significant surface or ground water impact anticipated. Consequently, no reduction measures are required

4. Plants

Find help answering plants questions

a. Check the types of vegetation found on the site:

☒ **deciduous tree: alder, maple, aspen, other**

☒ **evergreen tree: fir, cedar, pine, other**

☒ **shrubs**

☒ **grass**

☐ **pasture**

☐ **crop or grain**

☐ **orchards, vineyards, or other permanent crops.**

☐ **wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other**

☐ **water plants: water lily, eelgrass, milfoil, other**

☐ **other types of vegetation**

b. What kind and amount of vegetation will be removed or altered?

A minimal amount of trees and shrubs will be removed to accommodate the 50'x50' fenced area.

c. List threatened and endangered species known to be on or near the site.

None known

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any.

Existing vegetation around the perimeter of the facility will be retained as screening.

e. List all noxious weeds and invasive species known to be on or near the site.

None known

5. Animals

Find help answering animal questions[8]

a. List any birds and other animals that have been observed on or near the site or are known to be on or near the site.

Examples include:

- **Birds: hawk, heron, eagle, songbirds, other:**
- **Mammals: deer, bear, elk, beaver, other:**
- **Fish: bass, salmon, trout, herring, shellfish, other:**

b. List any threatened and endangered species known to be on or near the site.

Per the Washington Fish and Wildlife Priority Habitats and Species report dated 4/29/2025 listed species include Rocky Mountain Elk and Riverine. No species were identified or observed on site.

c. Is the site part of a migration route? If so, explain.

None known – Please see Washington Fish and Wildlife PHS report dated 4/29/2025

d. Proposed measures to preserve or enhance wildlife, if any.

None are needed

e. List any invasive animal species known to be on or near the site.

None known

[8] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-5-Animals

6. Energy and natural resources

Find help answering energy and natural resource questions[9]

a. **What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.**

   Electricity will be used to operate the radio equipment and antennae

b. **Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.**

   No

c. **What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any.**

   Low power consumption requirement for proposed equipment.

7. Environmental health

Health Find help with answering environmental health questions[10]

a. **Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur because of this proposal? If so, describe.**

   No

   1. **Describe any known or possible contamination at the site from present or past uses.**

      There are no known contaminates from past or present use.

   2. **Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.**

      There are no known or existing hazardous chemicals or conditions on the property.

   3. **Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.**

      There are no toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction. A future diesel generator may be placed on site. All liquid will be contained within the designed tank and comply with all fire safety regulations. No other conditions exist that will be impacted.

   4. **Describe special emergency services that might be required.**

[9] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-6-Energy-natural-resou
[10] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-7-Environmental-health

None required

5. **Proposed measures to reduce or control environmental health hazards, if any.**

   All radio frequency emissions are regulated by the Federal Communications Commission.

b. Noise

1. **What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?**

   None. Ambient noise will not affect this project.

2. **What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site)?**

   There will be some traffic and construction noise associated with the installation of the facility during the 4 - 6 weeks of construction. Minimal noise will be generated by the communications facility when it is fully operational. There may be minimal noise associated with monthly service visits.

3. **Proposed measures to reduce or control noise impacts, if any:**

   No noise is anticipated therefore, no measures are proposed.

8. Land and shoreline use

Find help answering land and shoreline use questions[11]

a. **What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.**

   The property is undeveloped. Adjacent uses are rural residential.

b. **Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses because of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?**

   No. There is no agricultural or forest land of long-term commercial significance that will be converted to other uses because of the proposal.

   1. **Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how?**

      No.

c. **Describe any structures on the site.**

[11] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-8-Land-shoreline-use

There are no structures on site. The property is undeveloped.

d. Will any structures be demolished? If so, what?

No

e. What is the current zoning classification of the site?

RDD-5 Rural Development District-5

f. What is the current comprehensive plan designation of the site?

Rural

g. If applicable, what is the current shoreline master program designation of the site?

Not applicable

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

No

i. Approximately how many people would reside or work in the completed project?

None

j. Approximately how many people would the completed project displace?

None

k. Proposed measures to avoid or reduce displacement impacts, if any.

None required

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any.

The project design will comply with Lewis County codes and ordinances. The project will be located on an undeveloped lot with existing vegetation around the perimeter utilized as screening.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

Not applicable

9. Housing

Find help answering housing questions[12]

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

None included in this proposal

[12] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-9-Housing

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

None

c. Proposed measures to reduce or control housing impacts, if any:

No housing impact anticipated, therefore no proposal is necessary.

10. Aesthetics

Find help answering aesthetics questions[13]

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

The monopole will be 150' in height.

b. What views in the immediate vicinity would be altered or obstructed?

No view alteration or obstruction is anticipated. Included in the application are photo simulations which provide detail that visual impact will be negligible.

c. Proposed measures to reduce or control aesthetic impacts, if any:

The facility is being placed on a 6.5 acre undeveloped property with existing vegetation around the property perimeter providing screening.

11. Light and glare

Find help answering light and glare questions[14]

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

None

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No

c. What existing off-site sources of light or glare may affect your proposal?

None

d. Proposed measures to reduce or control light and glare impacts, if any:

None are anticipated

[13] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-10-Aesthetics
[14] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-11-Light-glare

12. Recreation

Find help answering recreation questions

a. **What designated and informal recreational opportunities are in the immediate vicinity?**

   Hiking and fishing

b. **Would the proposed project displace any existing recreational uses? If so, describe.**

   No

c. **Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:**

   None

13. Historic and cultural preservation

Find help answering historic and cultural preservation questions[15]

a. **Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers? If so, specifically describe.**

   No

b. **Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.**

   A NEPA checklist will be completed prior to construction

c. **Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.**

   A NEPA checklist will be completed prior to construction

d. **Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.**

   There are no anticipated loss, changes to, or disturbance of resources. Therefore, no measures to avoid are proposed.

[15] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-13-Historic-cultural-p

14. Transportation

Find help with answering transportation questions[16]

a. **Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.**

   The site will be accessed from Birley Road then Skyview Drive to the location.

b. **Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?**

   Not applicable

c. **Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle, or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).**

   No

d. **Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.**

   No

e. **How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?**

   One vehicle semi-monthly. Typical maintenance schedule.

f. **Will the proposal interfere with, affect, or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.**

   No

g. **Proposed measures to reduce or control transportation impacts, if any:**

   None are necessary

15. Public services

Find help answering public service questions[17]

a. **Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.**

   No. The site is unmanned. There is no increased need for public services beyond those which are already provided.

[16] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-14-Transportation
[17] https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-15-public-services

b. Proposed measures to reduce or control direct impacts on public services, if any.

None

16. Utilities

Find help answering utilities questions[18]

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other:

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Centurylink – Fiber and utility trenching

Lewis County PUD – power and utility trenching

C.Signature

Find help about who should sign[19]

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Type name of signee: Bill North

Position and agency/organization: The North Group, Inc.

Date submitted: **May 7, 2025**

[18] https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-16-utilities

[19] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-C-Signature

Exhibit 3

IPaC **U.S. Fish & Wildlife Service**

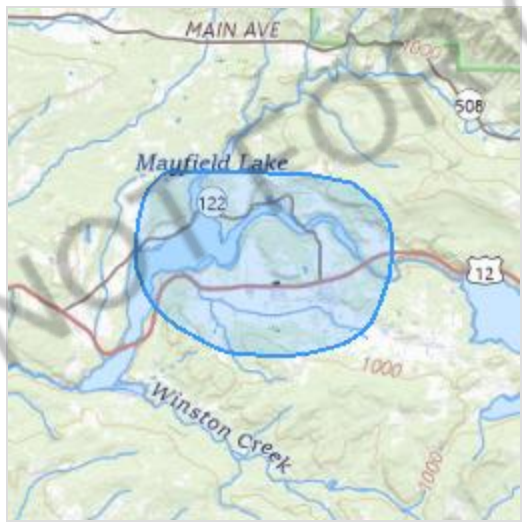
IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Lewis County, Washington



Local office

Washington Fish And Wildlife Office

(360) 753-9440
(360) 753-9405

1009 College St Se

Ste 215
Lacey, WA 98503-1249

https://www.fws.gov/office/washington-fish-and-wildlife

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Gray Wolf Canis lupus There is **final** critical habitat for this species. https://ecos.fws.gov/ecp/species/4488	Endangered

Birds

NAME	STATUS
Marbled Murrelet Brachyramphus marmoratus There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/4467	Threatened
Northern Spotted Owl Strix occidentalis caurina Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/1123	Threatened
Streaked Horned Lark Eremophila alpestris strigata Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/7268	Threatened
Yellow-billed Cuckoo Coccyzus americanus There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Reptiles

NAME	STATUS
Northwestern Pond Turtle Actinemys marmorata Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1111	Proposed Threatened

Fishes

NAME	STATUS
Bull Trout *Salvelinus confluentus* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/8212	Threatened

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* Wherever found There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/9743	Proposed Threatened
Suckley's Cuckoo Bumble Bee *Bombus suckleyi* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10885	Proposed Endangered

Flowering Plants

NAME	STATUS
Kincaid's Lupine *Lupinus sulphureus ssp. kincaidii* Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/3747	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

There are Bald Eagles and/or Golden Eagles in your project area.

Measures for Proactively Minimizing Eagle Impacts
For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the National Bald Eagle Management Guidelines. You may employ the timing and activity-specific distance recommendations in this document when designing your project/activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to Bald Eagle Nesting and Sensitivity to Human Activity.

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

If disturbance or take of eagles cannot be avoided, an incidental take permit may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the Do I Need A Permit Tool. For assistance making this determination for golden eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

Ensure Your Eagle List is Accurate and Complete
If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory

Birds and Eagles, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

Review the FAQs

The FAQs below provide important additional information and resources.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Mar 1 to Aug 31
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Mar 1 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that

week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

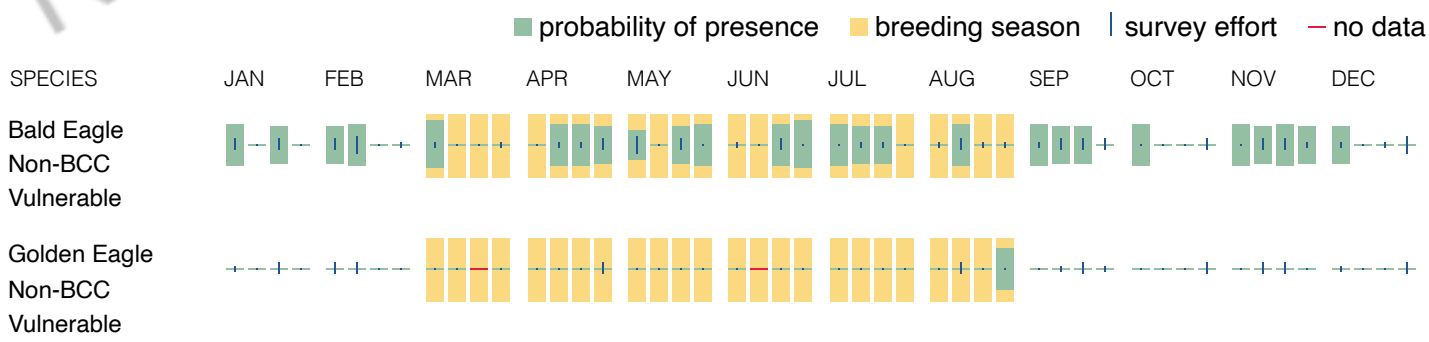
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Bald & Golden Eagles FAQs

What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are an eagle (Bald and Golden Eagle Protection Act requirements may apply).

Proper interpretation and use of your eagle report

On the graphs provided, please look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort line or no data line (red horizontal) means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list and associated information help you know what to look for to confirm presence and helps guide you in knowing when to implement avoidance and minimization measures to eliminate or reduce potential impacts from your project activities or get the appropriate permits should presence be confirmed.

How do I know if eagles are breeding, wintering, or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating, or resident), you may query your location using the RAIL Tool and view the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If an eagle on your IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your “IPaC PROBABILITY OF PRESENCE SUMMARY” at the top of your results list), there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

Interpreting the Probability of Presence Graphs

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. A taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:

The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season ()

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort ()

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data ()
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Migratory birds

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service).

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

Measures for Proactively Minimizing Migratory Bird Impacts

Your IPaC Migratory Bird list showcases birds of concern, including Birds of Conservation Concern (BCC), in your project location. This is not a comprehensive list of all birds found in your project area. However, you can help proactively minimize significant impacts to all birds at your project location by implementing the measures in the Nationwide avoidance and minimization measures for birds document, and any other project-specific avoidance and minimization measures suggested at the link Measures for avoiding and minimizing impacts to birds for the birds of concern on your list below.

Ensure Your Migratory Bird List is Accurate and Complete

If your project area is in a poorly surveyed area, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds

and Eagles document, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

Review the FAQs

The FAQs below provide important additional information and resources.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Mar 1 to Aug 31
California Gull Larus californicus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 1 to Jul 31
Chestnut-backed Chickadee Poecile rufescens rufescens This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 1 to Jul 31
Clark's Grebe Aechmophorus clarkii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jun 1 to Aug 31
Evening Grosbeak Coccothraustes vespertinus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 15 to Aug 10
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Mar 1 to Aug 31

Rufous Hummingbird Selasphorus rufus — Breeds Apr 15 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Western Grebe aechmophorus occidentalis — Breeds Jun 1 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/6743

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Migratory Bird FAQs

Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Avoidance & Minimization Measures for Birds describes measures that can help avoid and minimize impacts to all birds at any location year-round. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is one of the most effective ways to minimize impacts. To see when birds are most likely to occur and breed in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location, such as those listed under the Endangered Species Act or the Bald and Golden Eagle Protection Act and those species marked as “Vulnerable”. See the FAQ “What are the levels of concern for migratory birds?” for more information on the levels of concern covered in the IPaC migratory bird species list.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) with which your project intersects. These species have been identified as warranting special attention because they are BCC species in that area, an eagle (Bald and Golden Eagle Protection Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, and to verify survey effort when no results present, please visit the Rapid Avian Information Locator (RAIL) Tool.

Why are subspecies showing up on my list?

Subspecies profiles are included on the list of species present in your project area because observations in the AKN for **the species** are being detected. If the species are present, that means that the subspecies may also be present. If a subspecies shows up on your list, you may need to rely on other resources to determine if that subspecies may be present (e.g. your local FWS field office, state surveys, your own surveys).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go to the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating, or resident), you may query your location using the RAIL Tool and view the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your "IPaC PROBABILITY OF PRESENCE SUMMARY" at the top of your results list), there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Bald and Golden Eagle Protection Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially BCC species. For more information on avoidance and minimization measures you can implement to help avoid and minimize migratory bird impacts, please see the FAQ "Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds".

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Proper interpretation and use of your migratory bird report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list does not represent all birds present in your project area. It is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list and associated information help you know what to look for to confirm presence and helps guide implementation of avoidance and minimization measures to eliminate or reduce potential impacts from your project

activities, should presence be confirmed. To learn more about avoidance and minimization measures, visit the FAQ "Tell me about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds".

Interpreting the Probability of Presence Graphs
Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. A taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:
The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season ()
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort ()
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data ()
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1C
- PEM1A
- PEM1/SSA
- PEM1Ch
- PEM1Cx
- PEM1Fh

FRESHWATER FORESTED/SHRUB WETLAND

- PSSC
- PFOC
- PFOA
- PFO/SSC
- PSSCh
- PFOAh
- PSSCx
- PSSA
- PFOCh

FRESHWATER POND

- PUBHh
- PUBKx
- PUBHx
- PUBK

LAKE

- L1UBHh

RIVERINE

- R4SBC
- R5UBH
- R3UBH
- R4SBA

A full description for each wetland code can be found at the National Wetlands Inventory website

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this

inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Exhibit 4

CHAPTER 4

HABITATS OF GREATEST CONSERVATION NEED

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Chapter 4
Habitats of Greatest Conservation Need

4.0 Introduction and Overview

This chapter discusses the habitats and community types essential to the conservation of Species of Greatest Conservation Need (SGCN) in Washington. It summarizes the status and condition of those habitats, lists key stressors and research needs, and highlights actions to ensure their conservation. The information provided in this chapter addresses Elements 2, 3, and 4 of the eight required to be included in the State Wildlife Action Plan (SWAP). In this document, "species" is used to refer to species, subspecies, evolutionarily distinct units (ESU), and distinct population segments (DPS). Habitats of Greatest Conservation Need are defined for the purposes of the SWAP to include imperiled ecological systems (from a conservation perspective) as well as those ecological systems particularly important to SGCN. Ecological Systems and their relationship to fish and wildlife habitat are defined and described further in the discussion of methodology in this chapter.

Two major principles informed and shaped the discussion of habitats in the SWAP – adopting standardized classifications and focusing on spatial priorities.

Adopting standardized classifications to represent habitat

The SWAP associates SGCN with two vegetation levels using standard vegetation classification: vegetation formations as described in the National Vegetation Classification System; and ecological systems, as described by NatureServe. These two vegetation levels provide for general (formation level) to more specific (ecological system level) assessment of landscape level associations with multiple SGCN. The ecological systems for marine environments are described using the Coastal and Marine Ecological Classification Standard for nearshore, offshore, and oceanic ecological systems. These systems are subdivided by geographic regions of Puget Sound and the outer coast of Washington. The SWAP also associates SGCN with what are considered cultural or human created habitats (urban environments, agricultural fields, managed timberlands).

The use of these standardized classifications will facilitate cross referencing of conservation needs and objectives across state and international borders, promote collaborative efforts with other organizations, and provide access to enhanced mapping tools and products.

Focusing on collaborative, on-the-ground conservation action

Recognizing that conservation frequently entails collaboration and multiple partners, WDFW oriented this work with an eye towards being able to identify spatially explicit habitat conservation priorities, and those that are also shared by other entities. Ultimately, we want to determine the most productive places to achieve on-the-ground conservation.

Chapter Organization

This chapter begins with a few "at a glance" tables and summaries of the key features of the habitats discussed in the SWAP. Table 4-1 shows the full list of ecological systems found in Washington, and highlights those addressed in this chapter. Table 4-2 shows marine ecological systems in Washington, as defined for the SWAP. Table 4-3 summarizes information about the vegetation formations and Table 4-4

shows the relationship between ecoregions, vegetation formations, and ecological systems of concern. Ecoregions are broad areas that share similar flora and fauna, geology, hydrology, and landforms. Table 4-5 provides a summary of stressors present in the vegetative formations and ecological systems of concern.

The next section includes an overview fact sheet for each of the 16 vegetation formations found in Washington, representing the coarse filter scale – Figure 4-1 shows the distribution of these vegetation formations throughout Washington. These fact sheets provide a description of the vegetation and distribution, the number of SGCN associated with the formation and a list of important habitat needs for the SGCN in this formation. These fact sheets indicate the number of ecological systems of concern, major stressors to the vegetation formations (including climate change, if appropriate), examples of actions needed to provide and maintain habitat for SGCN, and key research and data needs. More detailed information is provided for the most imperiled ecological systems within each vegetation formation and those ecological systems with significant numbers of SGCN closely associated. In many cases, conservation attention will need to be focused at this scale to conserve the ecological values represented through the system.

The information for ecological systems of concern includes conservation rank (see methodology section below), status and trend, a list of species closely and generally associated with the ecological system of concern and, if there is one, the name that refers to this habitat type, generally, in the WDFW Priority Habitats and Species (PHS) Program. Stressors which impact habitat quality and actions to address those stressors are also summarized and discussed.

The final section of the chapter discusses how the conservation needs discussed in this chapter can be applied to on-the-ground conservation through the WDFW Priority Landscapes Initiative. An explanation of terms and abbreviations used in the chapter can be found in Section 4.4.1. References are provided in Sections 4.4.2 and 4.4.3.

Why use Ecological Systems?

Ecological systems are ecological units useful for standardized mapping and conservation assessments of habitat diversity and landscape conditions. They have been adopted nation-wide by many organizations as a vehicle for considering relationships to fish and wildlife species. Each ecological system type describes complexes of plant communities influenced by similar physical environments and dynamic ecological processes such as fire or flooding (NatureServe http://www.natureserve.org/conservation-tools/terrestrial-ecological-systems-united-states). Vegetation formations and ecological systems within Washington are mapped and maps are maintained and updated by Washington Department of Fish and Wildlife and Washington Department of Natural Resources. Because ecological systems provide clear descriptions of vegetation structure and type, and can be identified on the ground and mapped, they have tremendous value in assessing and determining the quantity and quality of wildlife habitat.

Ecoregions

This chapter also references the locations of formations and ecological systems by ecoregion. Ecoregions are based on broad patterns on the landscape and can provide another useful scale and spatial context for conservation planning. Further, several national and state based organizations use ecoregions in various planning initiative, and crosswalks between ecological systems, formations and ecoregions can help to support collaborative efforts. There are 63 ecoregions delineated in North America, and nine of these ecoregions occur partly or completely within Washington (Figure 2.1).

Figure 4-1: Ecoregions in Washington

Methodology

Associating species with ecological systems

Species of Greatest Conservation Need were associated with their use of ecological systems and vegetation formations to determine the relative values of each to wildlife. This step was a central and necessary component of our approach to defining and prioritizing habitats and community types important for species conservation. There is an underlying assumption that conserving ecological systems has direct benefits to wildlife species known (or currently not known) to occur within them. However, in doing so we recognized that using an ecological system based approach for habitat association purposes might not account for specific vegetative conditions (old-growth forest, for example), that can be critical components of habitat suitability. Ecological systems describe vegetation communities but do not account for ecological condition of those systems, or presence of habitat features (such as cavities in snags) that may be critical to wildlife. To address this, we included specific habitat features important to SGCN in each of the species fact sheets (see Appendix A), and included some of the most important habitat needs in the ecological system fact sheets included in this chapter.

Formal efforts to associate wildlife species with ecological systems in Washington began with the Washington Natural Heritage Program, which associated species with ecological systems beginning in 2009. Previously, several efforts were undertaken to associate wildlife species with habitat conditions, broad vegetation types, and cultural systems (Johnson and O'Neil 2001). This work remains a backdrop and major reference for conservation actions outlined in the plan.

For the State Wildlife Action Plan, WDFW set out to use professional judgement of biologists to assess whether species were closely or generally associated with a particular ecological system. In the absence of published literature, we opted to apply the principles of habitat use and preference to determine varying

levels of association with a particular system. Incorporating these levels of relative habitat value made the data useful for multiple types of analyses. We associated species and systems with four categories: closely associated, generally associated, unsuitable, and unknown. These associations are defined below.

1. Closely Associated: The species demonstrates preference for the ecological system, as indicated by greater occurrence, high densities, greater reproductive output, or other indicators of preference, as compared to other ecological systems. A species that is closely associated with individual ecological systems often relies on one to a few ecological systems for a significant part, or all, of its life history requirements.

2. Generally Associated: The species occurs in, but does not prefer, the ecological system, as indicated by relatively low occurrence or densities, or other indicators of a general relationship with the ecological system. A species that is generally associated with individual ecological systems can typically rely on numerous ecological systems to meet its life history requirements.

Note: A species can be closely associated with some ecological systems and generally associated with others, due to differences in occurrence, densities, reproductive output, or other indicators of preference.

3. Unsuitable: The species demonstrates no use or only occasional use of an ecological system.

4. Unknown: The species' use of the ecological system is unknown. There were questions or uncertainty whether or not a species used an ecological system.

Assessments were based upon our current understanding of information such as distribution, range, abundance, and density. Assessments were often based on an individual's knowledge of occurrence in Washington or nearby states and provinces and reflected best professional judgement given the lack of published biological information on these associations. For situations where ecological systems are currently functioning differently than they have historically, we associated species based on our understanding of the former functionality of the ecological system.

It is important to note that a species can be closely associated with specific habitats within an ecological system in which it is only generally associated. For example, spotted owls are closely associated with a specific habitat within forests with complex structure (e.g. mature and old-growth forest), but are only generally associated with multiple ecological systems within their range. In this case, association with ecological systems does not reflect the specific habitat requirements or needs of the species. In such cases the SWAP recommends actions targeted to the specific habitat within the ecological system.

For recovering species, we made associations with ecological systems based on an anticipated association during or following recovery. For some species, an association with one or more ecological system(s) may dramatically over-represent current distribution, as they may be associated with extremely small areas within the ecological system. For this reason, it must also be understood that the distribution of the ecological system does not imply that the SGCN is present everywhere that the ecological system is found. For certain species, including many slugs and snails, distribution, abundance, species needs, and habitat conditions are not well known, and that lack of knowledge made the determination of their association with ecological systems difficult.

Identifying and Profiling Ecological Systems of Concern

We identified Ecological Systems of Concern (ESOC) based on the conservation status rank of each ecological system. Each ESOC is described within the formation overview and specific stressors and actions are highlighted, as well as the SGCN associated with that system.

The Washington Natural Heritage Program assigned conservation status ranks to Washington's ecological systems using NatureServe's Conservation Status Rank calculator. The Conservation Status Rank is a measure of an ecological system's elimination risk. The rank is calculated using a measure of eight core factors relevant to risk assessment of elimination. The factors are organized into three categories: rarity, threats, and trends. Factors are scaled and weighted and subsequently scored according to their impact on risk. WDFW identified systems with S1, S1S2, and S2 ranks as Ecological Systems of Concern.

Ecological Systems Especially Important to SGCN

Habitats of Greatest Conservation Need include not only those ecological systems considered imperiled and in need of conservation attention (ecological systems of concern) but also those ecological systems which are especially important to SGCN – defined for this purpose as those with six or more SGCN being closely associated. These ecological systems are highlighted in each of the formation discussions. A list of all the ecological systems in Washington with the number of SGCN associated with them can be found in Table 4-1, as well as at the beginning of each formation discussion.

Identifying Vulnerability to Climate Change

Vulnerability to climate change has to date only been assessed for the Ecological Systems of Concerns, and not for the full breadth of ecological systems in Washington. Vulnerability was assessed by evaluating both inherent sensitivity to climatic changes and the degree of change the ecological system is likely to experience. We assigned a rank of low, moderate or high to each of the ecological systems of concern, and incorporated climate change into the discussion of key stressors for each of the vegetation formations and ecological systems, when appropriate. See Chapter 5 for more discussion on the methodology and full results of this ranking.

References for introduction (complete list at end of chapter)

Faber-Langendoen, D., J. Nichols, L. Master, K. Snow, A. Tomaino, R. Bittman, G. Hammerson, B. Heidel, L. Ramsay, A. Teucher, and B. Young. 2012. NatureServe Conservation Status Assessments: Methodology for Assigning Ranks. NatureServe, Arlington VA.

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Master, L., D. Faber-Langendoen, R. Bittman, G. A. Hammerson, B. Heidel, J. Nichols, L. Ramsay, and A. Tomaino (2009). NatureServe conservation status assessments: factors for assessing extinction risk. *NatureServe, Arlington, Virginia*.

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4.1 Summary of Key Habitat Features

The following tables and figures present summary information regarding distribution, SGCN association and key stressors and actions for SGCN Habitats (defined here as Vegetation Formation and Ecological Systems of Concern):

4.1.1 List of Vegetation Formations and Terrestrial Systems Found in Washington
4.1.2 Distribution of Formations
4.1.3 Marine Ecological Systems
4.1.4 Summary of Formations
4.1.5 Summary Figure of SGCN and ESOC Association with Formations
4.1.6 Table of Key Stressors and Conservation Actions for SGCN Habitats (defined here as Vegetation Formations and Ecological Systems of Concern)

4.1.1 Vegetation Formations and Terrestrial Ecological Systems in Washington

All major habitat types occurring in Washington are described and discussed in this chapter, with a focus on the values they provide for wildlife (see Figure 4-1 for a map of the distribution of the vegetation formations throughout Washington). Highlighted ecological systems of concern are discussed in greater detail within each formation because they are imperiled and/or because they are of particularly high conservation value to fish and wildlife.

▭ Ecologically imperiled (ecological system of concern)
** Especially important to the conservation of SGCN
© High vulnerability to climate change (see Chapter 5 for more information)

Table 4-1: Washington's Terrestrial Vegetation Formations and Associated Ecological Systems

VEGETATION FORMATION	TERRESTRIAL ECOLOGICAL SYSTEM	# SGCN Closely Associated	# SGCN Generally Associated
Alpine Scrub, Meadow & Grassland	North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fell-field and Meadow	2	10
	Rocky Mountain Alpine Dwarf Shrubland	0	1
	Rocky Mountain Alpine Fell-Field	1	2
	Rocky Mountain Alpine Tundra/Fell-field/Dwarf-shrub Map Unit	1	6
	Rocky Mountain Alpine Turf	0	1
Barren	North American Alpine Ice Field	0	4
	** Unconsolidated Shore	6	10
Bog & Fen	Boreal Depressional Shrub Bog	0	1
	North Pacific Bog and Fen ©	3	8
	Rocky Mountain Subalpine-Montane Fen	4	6
Cliff, Scree & Rock Vegetation	** Inter-Mountain Basins Active and Stabilized Dune	11	5
	** Inter-Mountain Basins Cliff and Canyon	5	10
	North Pacific Alpine and Subalpine Bedrock and Scree	1	8
	North Pacific Montane Massive Bedrock, Cliff and Talus	4	6
	Rocky Mountain Alpine Bedrock and Scree	1	4
	Rocky Mountain Cliff, Canyon and Massive Bedrock	2	3

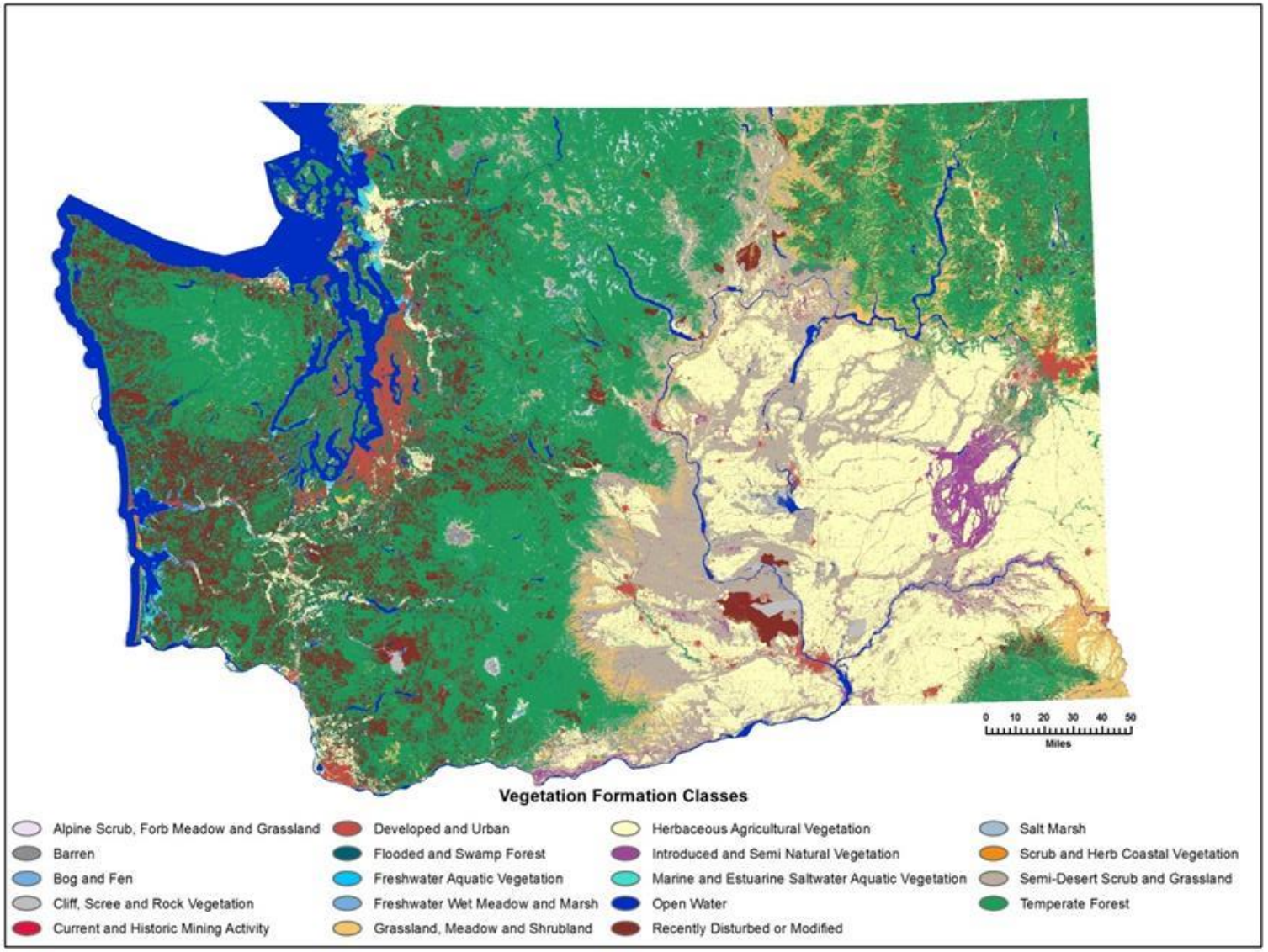
VEGETATION FORMATION	TERRESTRIAL ECOLOGICAL SYSTEM	# SGCN Closely Associated	# SGCN Generally Associated
Developed & Urban	Developed, High Intensity	1	0
	Developed, Low Intensity	1	29
	Developed, Medium Intensity	0	7
	Developed, Open Space	1	26
Flooded and Swamp Forest	**Columbia Basin Foothill Riparian Woodland and Shrubland©	10	15
	Great Basin Foothill and Lower Montane Riparian Woodland & Shrubland	1	7
	Inter-Mountain Basins Montane Riparian Systems	0	3
	North Pacific Hardwood-Conifer Swamp	1	14
	**North Pacific Lowland Riparian Forest and Shrubland	7	26
	North Pacific Montane Riparian Woodland and Shrubland	2	22
	North Pacific Shrub Swamp	1	11
	Northern Rocky Mountain Conifer Swamp	1	8
	** Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland ©	6	22
	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	4	16
	Rocky Mountain Subalpine-Montane Riparian Woodland	3	17
Freshwater Aquatic Vegetation, Wet Meadow, & Marsh	Avalanche Chute Shrubland	0	1
	Basalt Pothole Pond	1	2
	Coastal Interdunal Wetland	0	1
	Columbia Plateau Silver Sagebrush Seasonally Flooded Shrub Steppe	0	1
	Columbia Plateau Vernal Pool ©	3	5
	Modoc Basalt Flow Vernal Pool	0	1
	** North American Arid West Emergent Marsh	8	12
	North Pacific Avalanche Chute Shrubland	0	9
	North Pacific Coastal Interdunal Wetland	4	0
	North Pacific Hardpan Vernal Pool	0	1
	North Pacific Intertidal Freshwater Wetland	3	7
	Northern Columbia Plateau Basalt Pothole Pond	1	1
	Northern Rocky Mountain Avalanche Chute Shrubland	0	4
	Rocky Mountain Alpine-Montane Wet Meadow	3	9
	Rocky Mountain Subalpine-Montane Riparian Shrubland	0	11
	Subalpine-Montane Wet Meadow	0	1
	**Temperate Pacific Freshwater Aquatic Bed	17	12
	**Temperate Pacific Freshwater Emergent Marsh	5	16
	Temperate Pacific Freshwater Mudflat	2	3
	Temperate Pacific Montane Wet Meadow	3	9
	Temperate Pacific Subalpine-Montane Wet Meadow	1	3
	**Willamette Valley Wet Prairie	8	8
Grassland, Meadow & Shrubland	Columbia Basin Foothill and Canyon Dry Grassland	4	26

VEGETATION FORMATION	TERRESTRIAL ECOLOGICAL SYSTEM	# SGCN Closely Associated	# SGCN Generally Associated
	Columbia Basin Palouse Prairie	3	11
	**North Pacific Alpine and Subalpine Dry Grassland	7	7
	**North Pacific Herbaceous Bald and Bluff	8	3
	North Pacific Hypermaritime Shrub and Herbaceous Headland	2	3
	North Pacific Montane Shrubland	0	10
	Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland	1	14
	Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	3	11
	Northern Rocky Mountain Subalpine Deciduous Shrubland	1	7
	Northern Rocky Mountain Subalpine-Upper Montane Grassland	2	6
	Rocky Mountain Subalpine-Montane Mesic Meadow	2	13
	**Willamette Valley Upland Prairie and Savanna	15	8
Herb. Agricultural Vegetation	Cultivated Cropland	5	28
	Pasture/Hay	3	29
Introduced & Semi Natural Vegetation	Introduced Riparian and Wetland Vegetation	0	12
	Introduced Upland Vegetation - Annual Grassland	2	22
	**Introduced Upland Vegetation - Perennial Grassland and Forbland	5	24
	Introduced Upland Vegetation - Shrub	1	10
	Introduced Upland Vegetation - Treed	0	2
Open Water	Open Water (Fresh)	69	20
Recently Disturbed or Modified	Disturbed non-specific	1	8
	**Harvested Forest - Grass/Forb Regeneration	5	15
	**Harvested Forest - Northwestern Conifer Regeneration	6	22
	**Harvested Forest-Shrub Regeneration	5	13
	Recently Burned Forest	2	17
	Recently Burned Grassland	3	21
	Recently Burned Shrubland	2	14
Salt Marsh	Inter-Mountain Basins Alkaline Closed Depression	2	13
	Inter-Mountain Basins Greasewood Flat	2	9
	Inter-Mountain Basins Playa	3	7
	Temperate Pacific Tidal Salt and Brackish Marsh	1	18
Scrub and Herb Coastal Vegetation	North Pacific Coastal Cliff and Bluff	5	3
	North Pacific Maritime Coastal Sand Dune and Strand	8	3
Semi-Desert Scrub & Grassland	Columbia Plateau Low Sagebrush Steppe	2	14
	Columbia Plateau Scabland Shrubland	6	19
	**Columbia Plateau Steppe and Grassland	9	23
	**Inter-Mountain Basins Big Sagebrush Shrubland	15	22

VEGETATION FORMATION	TERRESTRIAL ECOLOGICAL SYSTEM	# SGCN Closely Associated	# SGCN Generally Associated
	**Inter-Mountain Basins Big Sagebrush Steppe ©	15	26
	Inter-Mountain Basins Mixed Salt Desert Scrub	3	14
	Inter-Mountain Basins Montane Sagebrush Steppe	2	12
	Inter-Mountain Basins Semi-Desert Grassland	2	16
	Inter-Mountain Basins Semi-Desert Shrub Steppe	3	8
Temperate Forest	Columbia Plateau Western Juniper Woodland and Savanna	3	11
	East Cascades Mesic Montane Mixed-Conifer Forest and Woodland	3	27
	**East Cascades Oak-Ponderosa Pine Forest and Woodland	7	12
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	0	6
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland	0	2
	Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	1	7
	North Pacific Broadleaf Landslide Forest and Shrubland	1	6
	**North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland	5	18
	North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest	4	28
	North Pacific Hypermaritime Sitka Spruce Forest	2	21
	North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest	3	22
	Inter-Mountain Basin Curl-leaf Mountain-mahogany Woodland and Shrubland	0	2
	North Pacific Lowland Mixed Hardwood-Conifer Forest and Woodland	0	27
	North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest	4	31
	**North Pacific Maritime Mesic Subalpine Parkland	7	16
	**North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest	5	30
	North Pacific Mesic Western Hemlock-Silver Fir Forest	0	21
	North Pacific Mountain Hemlock Forest	1	19
	**North Pacific Oak Woodland	6	12
	North Pacific Seasonal Sitka Spruce Forest	0	6
	North Pacific Wooded Volcanic Flowage	1	3
	**Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	11	26
	Northern Rocky Mountain Foothill Conifer Wooded Steppe	1	3
	Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	4	23
	**Northern Rocky Mountain Ponderosa Pine Woodland and Savanna ©	10	20
	Northern Rocky Mountain Subalpine Woodland and Parkland	2	20
	Northern Rocky Mountain Western Larch Savanna	0	12
	Rocky Mountain Aspen Forest and Woodland ©	0	12
	Rocky Mountain Lodgepole Pine Forest	2	20
	Rocky Mountain Poor-Site Lodgepole Pine Forest	1	10
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	3	17
	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	4	22

4.1.2 Distribution of Vegetation Formations

Figure 4-2: Distribution of Vegetation Formations



4.1.3 Marine Ecological Systems

Marine systems were divided into nine separate geographic regions. Two regions comprise the Pacific Ocean marine systems, and were separated for this planning effort at Point Grenville. Puget Sound and the Strait of Juan de Fuca were divided into seven regions; the Strait of Juan De Fuca, San Juan Islands and Georgia Basin, North Central Puget Sound, South Central Puget Sound, Hood Canal, Whidbey Island, and South Puget Sound. The first three marine ecological systems in Table 4-2 were defined and described in the National Vegetation Classification scheme. Comprehensive finer scale ecological systems description and mapping for the estuarine, nearshore, offshore, and oceanic marine ecological systems we used (Table 4-2) have not been developed for Washington waters using standardized methods such as available through the Coastal and Marine Ecological Classification Standard framework (http://coast.noaa.gov/digitalcoast/publications/cmecs).

Table 4-2: Washington's Seven Marine Ecological Systems

MARINE ECOLOGICAL SYSTEM	DESCRIPTION
Temperate Pacific Tidal Salt and Brackish Marsh	Emergent vegetation occurring in tidally influenced wetlands associated with estuaries, lagoons and bays, and behind sand spits.
Temperate Pacific Intertidal Mudflat	Sparsely vegetated areas within intertidal zones.
North Pacific Maritime Eelgrass Bed	Submerged vegetated systems dominated by the eelgrass *Zostera marina.* Found along all coastal areas, but especially abundant in the northern portion of Puget Sound north of Everett.
Estuarine	The portion of the estuary with constant water.
Nearshore	The area from shoreline to 100 feet (30 meters) deep and may include marine algae communities, such as kelp beds.
Offshore	The outer coastal area from 100 feet (30 meters) deep seaward to continental shelf break and may include marine algae communities, such as kelp beds.
Oceanic	The outer coastal area seaward of the continental shelf break and may include floating marine algae communities, such as *Sargassum* seaweeds.

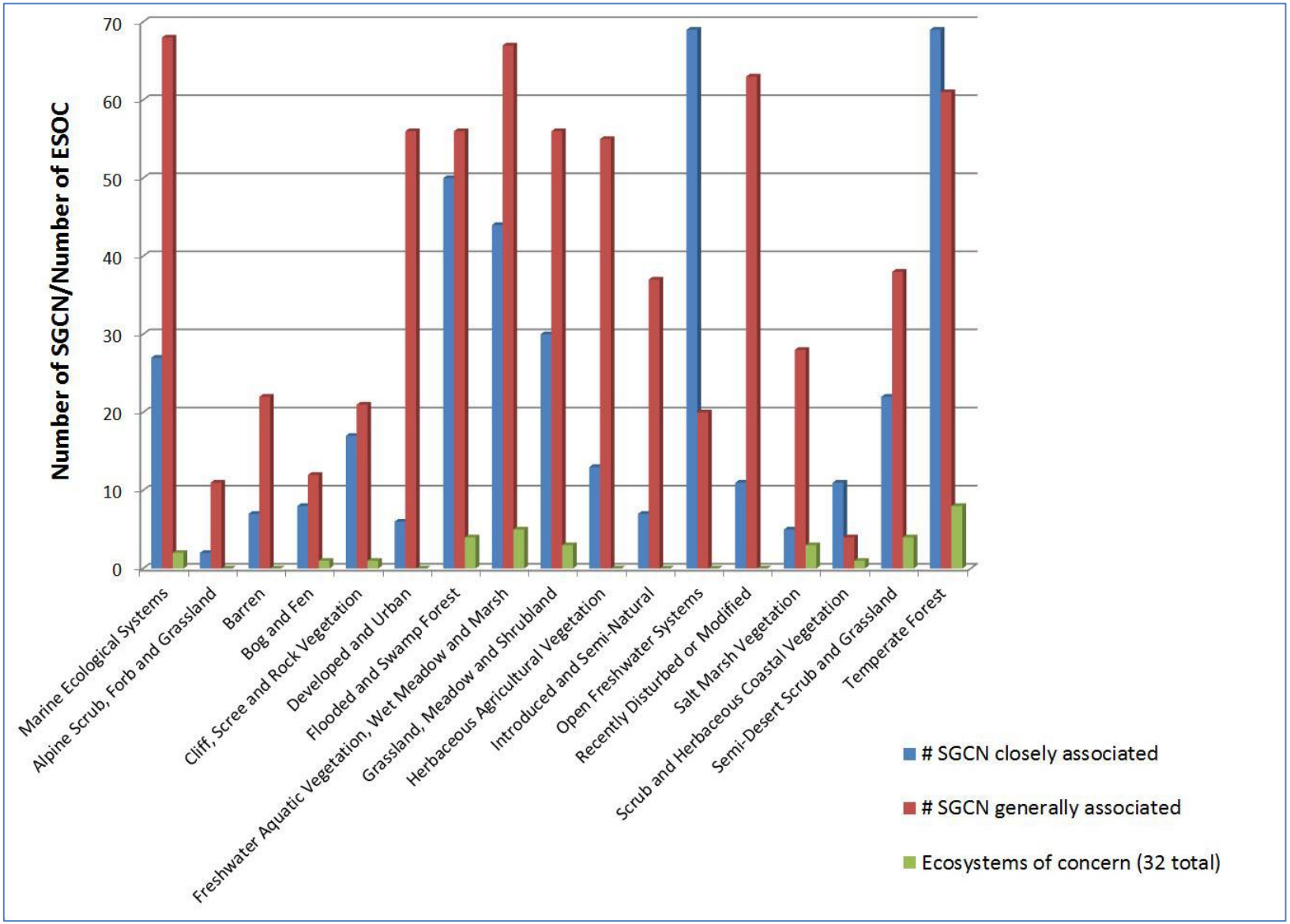
4.1.4 Summary of Vegetation Formations

Table 4-3: Summary of Washington's 16 Terrestrial Vegetation Formations

Vegetation Formation (17 total)	Distribution (mi^2)	# SGCN closely associated	# SGCN generally associated	Ecological systems of concern (37 total)	ECOREGIONS								
					Northwest Coast	West Cascades	Puget Trough	North Cascades	Columbia Plateau	Okanogan	**East Cascades**	Canadian Rocky Mtns	Blue Mountains
Alpine Scrub and Grassland	251	2	11	0	x	x		x	x	x	x		x
Barren	336	9	19	0	x	x	x	x		x	x		
Bog & Fen	19	7	11	1	x	x	x	x		x	x	x	
Cliff, Scree & Rock Vegetation	318	14	21	1	x	x	x	x	x	x	x	x	x
Developed & Urban	2040	6	57	0	x	x	x	x	x	x	x	x	x
Flooded & Swamp Forest	1479	49	54	4	x	x	x	x	x	x	x	x	x
Freshwater Aquatic Vegetation, Wet Meadow & Marsh	559	40	68	9	x	x	x	x	x	x	x	x	x
Grassland, Meadow & Shrubland	3707	31	20	3	x	x	x	x	x	x		x	x
Herbaceous Agricultural Vegetation	21,491	11	52	0	x	x	x	x	x	x	x	x	x
Introduced and Semi-Natural	1746	2	38	0			x		x	x	x	x	x
Open Water (freshwater)	4400	67	22	0	x	x	x	x	x	x	x	x	x
Recently Disturbed or Modified	6648	5	63	0	x	x	x	x	x	x	x	x	x
Salt Marsh Vegetation	224	3	25	4	x		x		x	x	x		x
Scrub & Herbaceous Coastal Vegetation	28	12	4	1	x	x	x						
Semi-Desert Scrub & Grassland	199	22	44	4		x	x	x	x	x	x	x	x
Temperate Forest	28,818	66	55	10	x	x	x	x	x	x	x	x	x

4.1.5 Summary of SGCN and ESOC Association with Formations

Figure 4-3: SGCN Associations by Washington's 16 Terrestrial Vegetation Formations



4.1.6 Key Stressors and Conservation Actions for SGCN Habitats (Formations and ESOCs)

Table 4-4: Key Stressors and Conservation Actions

VEGETATION FORMATION	ECOLOGICAL SYSTEMS OF CONCERN	STRESSORS												ACTIONS												
		Energy Development	Roads & Development	Alteration of Hydrology	Altered Fire Regime	Dams and Diversions	Agricultural side effects	Climate Change	Overharvesting	Invasive Species	Habitat Loss /degradation	Recreation Impacts	Need for Outreach/Ed	Habitat Conservation	Partner/Stakeholder Eng.	Water Management	Fire Management	Invasive Species Control	Create New Habitat	Grazing/Farm Mgmt.	Water Rights	Research or Surveys	Restoration	Land Use Planning	Private Lands Incentives
Alpine Scrub, Forb Meadow & Grassland Vegetation								x			x	x					x	x							
Barren		x	x			x		x			x	x		x										x	
Bog & Fen								x						x		x						x			
	North Pacific Bog & Fen		x	x			x	x						x		x								x	x
Cliff, Scree and Rock Vegetation								x					x	x										x	
	Inter-Mountain Basins Active and Stabilized Dune		x			x	x			x					x	x		x		x	x			x	
Developed and Urban		x	x		x	x			x		x				x	x						x	x	x	
Flooded & Swamp Forest			x			x	x	x	x	x					x					x		x	x	x	
	Columbia Basin Foothill Riparian Woodland & Shrubland		x			x	x	x	x	x					x	x		x		x	x	x	x	x	

VEGETATION FORMATION	ECOLOGICAL SYSTEMS OF CONCERN	STRESSORS												ACTIONS												
		Energy Development	Roads & Development	Alteration of Hydrology	Altered Fire Regime	Dams and Diversions	Agricultural side effects	Climate Change	Overharvesting	Invasive Species	Habitat Loss /degradation	Recreation Impacts	Need for Outreach/Ed	Habitat Conservation	Partner/Stakeholder Eng.	Water Management	Fire Management	Invasive Species Control	Create New Habitat	Grazing/Farm Mgmt.	Water Rights	Research or Surveys	Restoration	Land Use Planning	Private Lands Incentives
	North Pacific Hardwood Conifer Swamp			x					x	x								x					x	x	
	North Pacific Lowland Riparian Forest & Shrubland		x			x	x	x	x					x	x	x				x	x	x			x
	Northern Rocky Mountain Lower Montane Riparian Woodland & Shrubland						x	x		x						x		x		x				x	
Freshwater Aquatic Vegetation, Wet Meadow & Marsh			x	x		x	x	x		x	x					x		x				x	x		
	North American Arid West Emergent Marsh		x	x			x	x		x						x		x		x	x	x		x	x
	North Pacific Intertidal Freshwater wetland		x	x		x				x	x					x		x	x					x	
	Temperate Pacific Freshwater Emergent Marsh		x			x	x			x	x							x						x	
	Temperate Pacific Freshwater Mudflat	x	x			x				x	x					x		x	x					x	
	Willamette Valley Wet Prairie			x	x		x			x	x			x								x	x	x	x
Grassland, Meadow & Shrubland					x		x	x		x	x						x	x	x	x		x	x		

VEGETATION FORMATION	ECOLOGICAL SYSTEMS OF CONCERN	STRESSORS												ACTIONS												
		Energy Development	Roads & Development	Alteration of Hydrology	Altered Fire Regime	Dams and Diversions	Agricultural side effects	Climate Change	Overharvesting	Invasive Species	Habitat Loss /degradation	Recreation Impacts	Need for Outreach/Ed	Habitat Conservation	Partner/Stakeholder Eng.	Water Management	Fire Management	Invasive Species Control	Create New Habitat	Grazing/Farm Mgmt.	Water Rights	Research or Surveys	Restoration	Land Use Planning	Private Lands Incentives
	Columbia Basin Foothill & Canyon Dry Grassland				x		x			x							x	x	x	x			x	x	x
	Columbia Basin Palouse Prairie				x		x			x	x						x	x		x			x	x	
	Willamette Valley Upland Prairie & Savanna		x		x					x				x			x		x				x	x	x
Herbaceous Agricultural Vegetation							x		x				x		x							x		x	x
Introduced and Semi-Natural			x	x			x				x												x	x	x
Open Water			x	x		x		x			x				x	x						x	x	x	x
Recently Disturbed or Modified									x	x	x			x			x	x					x		
Salt Marsh Vegetation				x		x		x		x	x					x	x	x		x		x	x		
	Inter-mountain Basins Greasewood Flat		x	x	x		x			x				x				x		x				x	x
	Inter-mountain Basins Playa & Alkaline Closed Depression		x	x		x	x			x				x		x		x		x				x	x
	Temperate Pacific Tidal Salt & Brackish Marsh		x	x			x			x						x		x					x	x	

VEGETATION FORMATION	ECOLOGICAL SYSTEMS OF CONCERN	STRESSORS												ACTIONS												
		Energy Development	Roads & Development	Alteration of Hydrology	Altered Fire Regime	Dams and Diversions	Agricultural side effects	Climate Change	Overharvesting	Invasive Species	Habitat Loss /degradation	Recreation Impacts	Need for Outreach/Ed	Habitat Conservation	Partner/Stakeholder Eng.	Water Management	Fire Management	Invasive Species Control	Create New Habitat	Grazing/Farm Mgmt.	Water Rights	Research or Surveys	Restoration	Land Use Planning	Private Lands Incentives
Scrub & Herbaceous Coastal Vegetation								x		x	x	x		x				x				x	x		
	North Pacific Maritime Coastal Sand Dune & Strand									x	x			x				x					x	x	x
Semi-desert Scrub & Grassland		x	x		x		x	x		x							x	x		x		x	x		
	Columbia Plateau Low Sagebrush Steppe		x				x			x	x			x				x					x	x	x
	Columbia Plateau Steppe & Grassland	x	x		x		x			x	x			x			x	x		x			x	x	x
	Inter-Mountain Basins Big Sagebrush Steppe	x	x		x		x			x	x			x			x	x		x			x	x	x
	Inter-Mountain Basins Semi-desert Shrub Steppe		x		x		x			x	x			x			x	x		x			x	x	x
Temperate Forest			x		x		x	x	x	x				x			x	x		x		x	x	x	x
	East Cascades Oak-Ponderosa Pine Forest & Woodland		x		x		x			x				x			x	x					x	x	x
	North Pacific Dry Douglas-fir (Madrone) Forest & Woodland		x		x				x	x				x			x	x					x	x	x

VEGETATION FORMATION	ECOLOGICAL SYSTEMS OF CONCERN	STRESSORS												ACTIONS												
		Energy Development	Roads & Development	Alteration of Hydrology	Altered Fire Regime	Dams and Diversions	Agricultural side effects	Climate Change	Overharvesting	Invasive Species	Habitat Loss /degradation	Recreation Impacts	Need for Outreach/Ed	Habitat Conservation	Partner/Stakeholder Eng.	Water Management	Fire Management	Invasive Species Control	Create New Habitat	Grazing/Farm Mgmt.	Water Rights	Research or Surveys	Restoration	Land Use Planning	Private Lands Incentives
	North Pacific Hypermaritime Sitka Spruce Forest		x		x				x	x				x			x	x					x	x	x
	North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest		x		x			x	x	x				x				x					x	x	x
	North Pacific Oak Woodland		x		x					x				x			x	x					x	x	x
	Northern Rocky Mountain Ponderosa Pine Woodland & Savanna		x		x		x	x		x				x			x	x					x	x	x
	Northern Rocky Mountain Western Larch Savanna		x		x			x		x				x			x	x					x	x	x
	Rocky Mountain Aspen Forest & Woodland		x		x					x				x			x	x					x	x	x

4.2 DESCRIPTIONS OF VEGETATION FORMATIONS AND ECOLOGICAL SYSTEMS OF CONCERN

Terrestrial habitats (defined here by vegetation formations and ecological systems) are discussed first, followed by marine systems (page 102)

ALPINE SCRUB, FORB MEADOW AND GRASSLAND VEGETATION

Overview

Alpine scrub, forb meadow and grassland vegetation formation includes five ecological systems, two of which are closely related: Rocky Mountain Alpine Dwarf Shrubland, Fell-Field and Turf, and North Pacific Dry and Mesic Alpine Dwarf-shrubland, Fell-field and Meadow. These are vegetated areas found above the environmental limit of trees, at the highest elevations of the Olympic and Cascade Mountains. They typically include cold, windblown areas supporting a mosaic of dwarf-shrublands, fell fields, tundra (sedge tufts), and sparsely vegetated snowbed communities. Small patches of krummholz (shrub-form trees) are also part of this system and occur at the lower elevations. These systems differ primarily in geographic distribution and resulting difference in associated flora.

Sites are slopes and depressions where snow lingers, where the soil has become relatively stabilized, and where the water supply is more or less constant. Dwarf shrublands are often found on level or concave glacial topography, with late-lying snow and sub-irrigation from surrounding slopes. Fell fields are found in wind-scoured areas such as ridgetops and exposed saddles. SGCN with close association within these ecological systems are White-tailed Ptarmigan and Olympic Marmot. SGCN with general association are Golden Eagle, American Pika, Cascade Red Fox, Grizzly Bear, Northern Bog Lemming, Wolverine, Cascades Needlefly, Northern Forestfly, two species of mayfly (*Cinygmula gartrelli, Paraleptophlebia falcula*) and one caddisfly (*Allomyia acanthis*). This formation contains no ecological systems of concern.

Formation Summary				
Distribution	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
156 mi^2	>99%	<1%	2	11

Ecological systems found in this formation	Number of SGCN	
	closely associated	generally associated
North Pacific Dry and Mesic Alpine Dwarf Shrubland	2	10
Rocky Mountain Alpine Dwarf Shrubland	0	1
Rocky Mountain Alpine Tundra	1	6
Rocky Mountain Alpine Turf	0	1

Major stressors

Climate change, which may result in reduced snowpack and encroachment by trees and shrubs, is a major stressor. Trampling and associated recreational impacts are a major source of human disturbance. In recent years, Olympic Marmots have disappeared from some of the driest meadows in the northeast Olympic Mountains.

Habitat needs for SGCN associated with this vegetation formation

Prevent encroachment of trees and large shrubs	Trees and large shrubs are encroaching on habitat in the Olympic Peninsula and the Cascades, providing a potential threat to species like the Olympic Marmot and White-tailed Ptarmigan, both closely associated with these systems.

Actions needed to maintain habitat quality for SGCN

- Fire management (establishment of natural fire regimes and prescribed fire).
- Control of invading species, primarily native trees and shrubs.

Key research and data needs

- Conducting prescribed fire to enhance habitat and minimize public concerns.

Specific Ecological System References (complete list at end of chapter)

Edelman, A. J. 2003. *Marmota olympus*. Mammalian Species 736: 1-5.

Schroeder, M. A. 2005. White-tailed ptarmigan. Page 68 in T. R. Wahl, B. Tweit, and S. G. Mlodinow, editors. Birds of Washington. Oregon State University Press, Corvallis, Oregon.

BARREN

Overview

Barren vegetation formation includes two ecological systems, Unconsolidated Shore and Alpine Ice Field. Unconsolidated shore is material such as silt, sand, or gravel that is subject to inundation and, most importantly, redistribution due to the action of water in high energy environments (e.g. beaches, rivers). It is characterized by substrates lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable. Erosion and deposition by waves, currents, and seasonal flooding produce a number of landforms representing this class; the most common examples include sand and rock beaches along the outer coast and braided gravel beds associated with rivers and streams. Alpine ice fields include glaciers and perennial snow and ice features.

The ecological system with the most closely and generally associated species in this formation is the Unconsolidated Shore (see below). Seven SGCN have a close association with Unconsolidated Shore: American White Pelican, Dusky Canada Goose, Harlequin Duck, Peregrine Falcon, Rock Sandpiper, Western Snowy Plover and Puget Sound Chinook Salmon ESU. A complete analysis of habitat association has not been done for all SGCN anadromous and freshwater fishes, thus it is possible that other SGCN fishes may be closely associated with the system within this formation. This formation contains no ecological systems of concern.

Formation Summary				
Distribution	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
209 mi^2	84%	1%	7	22

Ecological systems found in this formation	Number of SGCN	
	closely associated	generally associated
North American Alpine Ice Field	0	4
Unconsolidated Shore	6	10

Major stressors

Climate change is a significant stressor for the Unconsolidated Shore in coastal areas (rise of sea level, shoreline armoring limits the flow of sediment in shorelines) and Alpine Ice Field ecological system (decline of glaciers and reduction in snowpack). Other major stressors for SGCN include human disturbance on beaches important for Western Snowy Plover nesting, deposition of dredge spoils on Streaked Horned Lark nesting islands, and human modification of river flow processes, which can alter sand and gravel deposits.

Habitat needs for SGCN associated with unconsolidated shore

Unvegetated condition	Species use in these systems results from an absence of vegetation and re-setting of succession caused by disturbance and perhaps to some extent to its proximity to open water. This system is used for nesting (e.g. Western Snowy Plover), roosting (e.g. Brown Pelican) and foraging (e.g. Rock Sandpiper).
High invertebrate abundance/ diversity	Invertebrates are important food for Harlequin Ducks and Rock Sandpipers, among others.
Floodplain gravel beds	Gravel beds within river floodplains are important for maintaining spawning habitat for salmonids and contributing to instream habitat for other fishes.

Actions needed to maintain habitat quality for SGCN

Use of alternative techniques to shoreline and river armoring can protect both development and fresh and salt water shorelines. Restoration of floodplains, such as by dike removal or set-back, can allow gravel beds to develop and increase. Actions to prevent oil spills are needed to avoid significant impacts to wildlife using unconsolidated shore.

BOG AND FEN

Overview

Bog and fen vegetation formation includes three ecological systems in Washington: North Pacific Bog and Fen, Rocky Mountain Subalpine–Montane Fen, and Boreal Depressional Shrub Bog. Most bogs and fens are less than 12 acres in size. The North Pacific Bog and Fen ecological system is composed of peatlands that occur as small patches along the Pacific coast from southeastern Alaska to northern California, in and west of the coastal mountain summits including the Puget Sound lowlands. The Rocky Mountain Subalpine-Montane Fen ecological system includes high elevation wetlands with organic soils in eastern Washington. It is confined to specific environments where perennial groundwater discharge occurs, such as low points in the landscape or near slopes where groundwater intercepts the soil surface, or along pond/lake shorelines. Note that the North Pacific Bog and Fen component of this formation is profiled as an ecological system of concern.

Bogs and fens differ from other wetlands in having a substrate composed of organic material, typically in the form of peat and muck. The origin of the peat can be *Sphagnum* moss, 'brown' mosses, sedges, or woody species. Within the North Pacific Bog and Fen ecological system, vegetation is usually a mix of conifer-dominated overstory, shrubs, and open *Sphagnum* or sedge lawns, often with small ponds and pools interspersed. Graminoids, evergreen or deciduous broadleaf shrubs, or evergreen needleleaf trees are commonly dominant. Many plant species are confined to this formation.

Formation Summary				
Distribution	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
13 mi^2	43%	57%	8	12

Ecological systems found in this formation	Number of SGCN	
	closely associated	generally associated
Boreal Depressional Shrub Bog	0	1
North Pacific Bog and Fen	3	8
Rocky Mountain Subalpine-Montane Fen	4	6

Ecological System of Concern

Habitat needs for SGCN associated with this vegetation formation

High ecological integrity	Many of the invertebrates associated with this system are associated with native plants, high ecological integrity, and are sensitive to invasive shrubs and grasses.
Adequate groundwater level	Fish that use ponds and pools of this system, such as Olympic Mudminnow, require adequate ground water levels to maintain the water bodies.

Climate Change

Climate changes such as decreased precipitation, reduced snowpack, or prolonged drought that reduces water availability and recharge may lead to range contraction and/or habitat conversion, increased invasion

of dry-adapted species, or tree encroachment in bog and fen habitats. Shifts from snow to rain that enhances winter/spring flood risk may increase erosion of moist peat and topsoil, reduce opportunities for recharge, and/or lead to drying of habitats.

Actions needed to maintain habitat quality for SGCN

Site protection; sites with high ecological integrity and corresponding SGCN should be identified and protected. Groundwater withdrawals should be regulated to preserve groundwater levels needed to maintain aquatic habitat conditions.

Research and data needs

While some bogs have been surveyed in detail, most have not. The range of rare species, including several beetles and Makah Copper are not thoroughly documented.

Ecological systems discussed in greater detail in this section

Of the two ecological systems found in this formation, North Pacific Bog and Fen is discussed in greater detail here. It is considered an ecological system of concern because of its imperiled conservation status and because of its importance to SGCN.

North Pacific Bog and Fen (ESOC)

Description and Distribution

The North Pacific Bog and Fen ecological system is located primarily in the North Pacific Ecoregion, but is sporadically distributed through the west side and eastern slopes of the Cascades. Elevations are mostly under 1500 feet, and annual precipitation ranges from 35 to 120 inches. However, fens are also found within the Cascades and Olympic Mountains. The system is found in primarily in glaciated terrain but also in river valleys, around lakes and marshes, behind coastal sand dunes, or on slopes. Four SGCN are closely associated with this ecological system: Olympic Mudminnow, Beller's Ground Beetle, Hatch's Click Beetle, and Makah Copper.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes Freshwater Wetlands	S2	Imperiled/ declining Declines of 30-50% in last 50 years and from historical condition	**MAMMALS:** Gray Wolf, Western Spotted Skunk, Townsend's Big-eared Bat, Keen's Myotis, Hoary Bat, Silver-haired Bat
			BIRDS: Greater Sandhill Crane
			AMPHIBIANS: Western Toad
			FISH: Olympia Mudminnow*
			INVERTEBRATES: Beller's Ground Beetle*, Hatch's Click Beetle*, Makah Copper*

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Historical and contemporary land use practices have impacted hydrologic, geomorphic, and biotic structure and function of peatlands in western Washington. Conversion of peatlands for agriculture has resulted in significant loss of peatland extent. These areas are often cultivated for food crops such as blueberries and cranberries.

Reservoirs, water diversions and withdrawals, ditches, roads, and human land uses in the contributing watershed (fens) or surrounding landscape can also have a substantial impact on the hydrological regime. Direct alteration of hydrology (i.e., channeling, draining, damming) or indirect alteration (i.e., roads or removing vegetation on adjacent slopes) results in changes in species composition and wetland extent. Water diversions and ditches can have a substantial impact on the hydrology as well as biological integrity of peatland.

Climate change poses a particular future threat to this system. Bog and fen habitats, particularly those that depend on surface water, are sensitive to drier climate conditions that can lead to habitat conversion or range contraction, increased invasion of dry-adapted species.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Agriculture and aquaculture side effects	Conversion to agriculture eliminates and degrades habitat	• Grazing/farm management • Land acquisition • Land use planning • Private lands agreements	Protect key sites through acquisition, easement, low intensity land uses, and protection of hydrology Support creation of GMA-based Voluntary Stewardship Plans
Roads and development	Development near bogs and fens degrades habitat	• Land acquisition • Land use planning • Environmental review • Private lands agreements	Protect key sites through acquisition, easement, low intensity land uses and protection of hydrology
Alteration of hydrology	Alteration of hydrology degrades habitat	• Water management	Maintain or re-configure hydrological sources and routes
Climate change	Drier conditions may lead to habitat conversion or range contraction	• Address existing stressors	Build resilience for added stress of climate change by addressing existing stressors

CLIFF, SCREE AND ROCK VEGETATION

Overview

Cliff, scree and rock vegetation include seven systems that generally have little or no vegetation or soil development. Please see Table 4-1 for a complete list of these systems. They include steep cliff faces, narrow canyons, and larger rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Some systems are characterized by the presence of unstable scree and talus that typically occur below cliff faces as well as sand dunes. Small patches of dense vegetation, typically scattered trees or shrubs, can occupy rock fractures and less steep or more stable slopes. Although herbaceous cover tends to be limited in these systems mosses or lichens may be very dense and well-developed, displaying well over 10 percent cover.

The ecological system with the most closely and generally associated species in this system is Inter-Mountain Basins Cliff and Canyon. Species with close association with this system include Ferruginous Hawk, Golden Eagle, Peregrine Falcon, Spotted Bat, and Night Snake. Note that the Inter-Mountain Basins Active and Stabilized Dune component of this formation is an ESOC.

Formation Summary				
Distribution	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
610 mi^2	91%	9%	17	21

Ecological systems found in this formation	**Number of SGCN**	
	closely associated	**generally associated**
Inter-Mountain Basins Active and Stabilized Dune	11	5
Inter-Mountain Basins Cliff and Canyon	5	10
North Pacific Alpine Bedrock and Scree	1	8
North Pacific Montane Bedrock, Cliff and Talus	4	6
Rocky Mountain Alpine Bedrock and Scree	1	4
Rocky Mountain Cliff, Canyon and Bedrock	2	3

Ecological System of Concern

Major Stressors

- Much of this system occurs in designated wilderness areas and is not exposed to serious threats. This system is generally inaccessible which precludes most human activities.
- Global climate change could alter species composition of this system possibly by allowing more vascular plant species to establish as well as a shift in species composition.
- Invasive plants are mainly a threat within the Inter-Mountain Basins Active and Stabilized Dune ecological system. This is generally not much of a threat to the other ecological systems associated with Cliff, Scree, and Rock vegetation.

Habitat needs for SGCN associated with this vegetation formation

Nesting habitat	Golden Eagle and Peregrine Falcon nest on cliffs and rock faces.
Habitat complexity	Voids and fissures in rock and talus provide denning habitat for American Pika, Wolverine, and Olympic Marmot. Cliffs are also critical habitat year-round for Spotted Bats.

Actions needed to maintain habitat quality for SGCN

- Activities that disturb or displace species that use the system should be discouraged or not allowed during sensitive times. Those activities may include mining or recreation such as rock climbing.
- Activities that remove habitat such as substrate mining should be discouraged.

Ecological systems discussed in greater detail in this section include:

A. Inter-Mountain Basins Active and Stabilized Dune

Inter-Mountain Basins Active and Stabilized Dune (ESOC)

Conservation Status and Concern

Most examples of this system in Washington have either been converted over by various land use activities or have been significantly altered. Sixteen SGCN are associated with Inter-mountain Basins Active and Stabilized Dunes, more than half of which are closely associated with this ecological system. It is an especially important habitat for many of the SGCN amphibian and reptiles of eastern Washington.

Description and Distribution

Although these dunes are primarily restricted to the Columbia Plateau Ecoregion, a few occur in the Okanogan Ecoregion as far north as the boundary with British Columbia in Okanogan County. Sand dunes are highly dynamic systems and patterns of plant species composition are closely related to sand erosion, deposition and dune migration and stabilization (Chadwick and Dalke 1965). These processes may occur rapidly, leaving legacies from previous vegetation types. While repeating patterns of vegetation are observed and allow the identification of community types, they are often present in a spatially complex, fine-scale mosaic. The boundaries between community types range from distinct to highly blurred (Easterly and Salstrom 1997).

Sand dunes support vegetation if wind stress is not too great (WDFW 2008). Although vegetation tends to be variable, dunes often consist of plants common to shrub-steppe, such as antelope bitterbrush, rabbitbrush and snow buckwheat. However, some plants are more restricted to sand dune, such as, Indian Ricegrass, Lemon Scurfpea, and Veiny Dock. The vegetation cover is related to annual rainfall totals and evapotranspiration rates. The mobility of sand dunes is related to the power of the wind, while a dune's mobility becomes inhibited as vegetation cover increases. Long periods of increased precipitation and persistent presence of vegetation may lead to a sand surface covered by litter and/or mosses and lichens. These same factors also can initiate soil formation, which can cause dune stabilization. Periods of drought are generally unfavorable to vegetation and can reinitiate the mobility of sands (WDFW 2008).

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes Inland Dunes	S1	Critically imperiled/ declining Declines of 50-70% in last 50 years and 70-80% from historical condition	**MAMMALS:** Spotted Bat
			BIRDS: Ferruginous Hawk*, Short-eared Owl
			REPTILES/AMPHIBIANS: Northern Leopard Frog*, Western Toad, Woodhouse's Toad*, Desert Nightsnake, Sagebrush Lizard*, Pygmy Short-horned Lizard*, Side-blotched Lizard*, Striped Whipsnake*
			INVERTEBRATES: Three Noctuid Moths*, Columbia River Tiger Beetle*, Morrison's Bumblebee

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Washington inland sand dune systems have declined approximately 76 percent from the early 1970s, primarily as a result of conversion to agricultural, reservoir flooding, and dune stabilization (Hallock et al. 2007). Currently, the major threats to Washington's inland sand dunes are invasive species, agricultural conversion, including the effects of adjacent irrigation, off-road vehicle use, dune stabilization, home development, mining, and livestock grazing (Hallock et al. 2007).

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Invasive and other problematic species	Exotic grasses invading and introduced to actively stabilize dunes are major threat.	• Invasive species control • Partner/stakeholder engagement	Integrated habitat restoration using prescribed fire, weed control, and seeding with native vegetation.
Dams, levees and diversions	The Columbia River Irrigation Project has increased water table creating interdunal wetland and ponds that stabilized dunes.	• Water management • Water rights acquisition • Partner/stakeholder engagement	Remove water retention structures and encourage water conservation in agriculture.
Agriculture and aquaculture side effects	Conversion to agriculture eliminates and degrades habitat	• Grazing/farm management • Land use planning	Protect key sites with low intensity land uses. Support creation of GMA-based Voluntary Stewardship Plans
Roads and development	Dune stabilization for homes and roads has a cumulative effect on inland dunes.	• Land use planning	Site homes and road to minimize impacts to dunes.

Specific Ecological System References (complete list at end of chapter)

Hallock, L. A., R. D. Haugo, and R. Crawford. 2007. Conservation strategy for Washington State inland sand dunes. Natural Heritage Report 2007-05. Prepared for the Bureau of Land Management. Washington Department of Natural Resources. Olympia, Washington.

Washington Department of Fish and Wildlife (WDFW). 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.

DEVELOPED AND URBAN

Overview

Developed and urban areas include the range of human affected landscapes from low intensity to high-intensity development. Developed and urban areas are characterized by a high percentage (30% or greater) of constructed materials (asphalt, concrete, buildings, etc...) Impervious surfaces account for 20 to 100 percent of total cover. This includes areas like large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. It also includes more developed areas including apartment complexes, row houses, and commercial/industrial uses, where people reside or work in high numbers.

Many think that when lands are developed they lose almost all value as fish and wildlife habitat. Although the habitat needs for most SGCN do not exist in developing and urban landscapes, development never eliminates all fish and wildlife habitat. In fact, even though trends in the number of native species decline along a gradient from rural, to suburban, to the urban core, many native species as well as some SGCN are surprisingly resilient and tolerant of the presence of people. Peregrine Falcons nesting on a downtown Seattle skyscraper is an example of how a SGCN can adapt.

Open spaces as well as artificial structures (e.g., bridges, eaves, and feeders) in developed landscapes can also provide suitable nesting, roosting, and foraging opportunities for SGCN and other native species. Although only three terrestrial SGCN, the Peregrine Falcon, Streaked Horned Lark and Sharp-tailed Snake, are generally associated with many of the Developed and Urban ecological systems, other species use these systems as habitat in Washington. Many salmonid SCGN must migrate through rivers that run through developed and highly urbanized areas, thus effects on water quality and condition of riparian areas are of particular concern. Some of their spawning areas are closely associated with developed areas. SGCN salmonids that migrate long distances within the Columbia Basin are exposed to multiple developed areas, resulting in a close association with this habitat form. Problems arise when poorly-placed development or low-density urban sprawl removes and degrades once-important habitat. With population forecasts showing an additional two million Washingtonians by 2040, advising land use managers regarding ways to perpetuate fish and wildlife while accommodating population and economic growth will be one of our most important responsibilities for conserving fish and wildlife habitat across the state.

Formation Summary				
Distribution	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
2,039 mi^2	11%	89%	6	56

Ecological systems found in this formation	**Number of SGCN**	
	closely associated	**generally associated**
Developed, High Intensity	0	0
Developed, Low Intensity	1	29
Developed Medium Intensity	0	7
Developed, Open Space	1	26

Major Stressors

- Degraded habitat and connectivity from low-density urban sprawl.
- Degraded habitat structure from fire suppression in and around rural and exurban home sites.
- Increased human-wildlife conflicts (e.g., Cougar encounters, roadkill deer).
- Harassment and predation by people and domestic animals (e.g., house cats and songbirds).
- Water quality degradation from point and non-point source pollution; temperature problems form lack of shading
- Water quantity: high flow problems due to watershed imperviousness, loss of floodplain connectivity and lack of large wood; low flow problems due to water withdrawal and reduced capacity of the watershed to store/infiltrate precipitation.
- Loss and degradation of nearshore and estuarine habitats from industrial and residential development.
- Loss of stream and river habitat and connectivity due to fish passage barriers such as road crossings, culverts, and dams.

Habitat needs for SGCN associated with this formation

Habitat connectivity/ corridors	A number of SGCN that use Developed and Urban ecological systems have limited mobility, inhibiting their movement across barriers such as roads and subdivisions. These low mobility SGCN primarily consist of small rodents, reptiles, and amphibians. SGCN anadromous fishes need passage improvements where various types of instream barriers currently block or impede migrations.
Lower development densities	Most associated SGCN do best where development densities are low (1 home per 10 to 20 acres). However, many of the same species can exist when densities are greater (1 home per 5 acres), so long as development proposals incorporate conservation measures (e.g., cluster development) and do not degrade surface and sub-surface water quality or quantity.
Public education	A better grasp of the needs of SGCN by the public (and especially urban citizens) will help them become better stewards of landscapes and advocates for conservation.
High water quality standards	Most SGCN fishes are likely to be adversely affected by poor water quality. Pollution abatement in water run-off from urban and industrial areas often needs improvement. Sewage treatment systems in low to high intensity developed areas may also be pollution sources. Water withdrawals from rivers and aquifers may reduce flows affecting multiple aspects of water and riverscape habitat quality.

Actions needed to maintain habitat quality for SGCN

- Assist local jurisdictions with land use (e.g., GMA, SMA) planning and watershed planning using PHS products and tools such as High Resolution Change Detection, Puget Sound Watershed Characterization, NetMap, and NatureServe's Vista.
- Provide feedback to local jurisdictions about the effectiveness of their land use regulations and incentives to conserve ESOCs and Priority Habitats.
- Create database spatial priorities in developing landscapes to protect habitat for SGCN and Priority Species.

- WDFW staff community involvement (e.g., schools and community groups, backyard bird sanctuary enrollments, citizen science projects).
- Management and enforcement of instream flow standards.
- Assist local governments and NGOs prioritize restoration projects (e.g., tree plantings, invasive weed removal, fish passage barrier removal, and retrofitting substandard stormwater facilities).

Research and Data Needs

- Update PHS management recommendations for specific SGCN which can be used by local governments in their land use ordinances and GMA/SMP updates to protect fish and wildlife and their habitats.
- Continue biennial updates to the High Resolution Change Detection dataset for the Puget Sound basin; expand the analysis to include Priority Habitats and ESOCs statewide.

Specific Ecological System References (complete list at end of chapter)

Ferguson, H. L., K. Robinette, K. Stenberg. 2001. Wildlife of urban habitats. Pages 317-341 *in* D. H. Johnson and T. A. O'Neil, Managing Directors. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Linders, M. J., W. M. Vander Haegen, J. M. Azerrad, R. Dobson, and T. Labbe. 2010. Management Recommendations for Washington's Priority Species: Western Gray Squirrel. Washington Department of Fish and Wildlife, Olympia, Washington.

Washington Department of Fish and Wildlife (WDFW). 2009. Wildlife in a developing landscape. Pages 1-1 to 1-3 *in* Landscape planning for Washington's wildlife: managing for biodiversity in developing areas. J. Azerrad, J. Carleton, J. Davis, T. Quinn, C. Sato, M. Tirhi, S, Tomassi, G. Wilhere, authors. WDFW, Olympia, Washington.

Washington Office of Financial Management. 2014. State of Washington forecast of the state population: November 2014 forecast.

FLOODED AND SWAMP FOREST

Overview

Flooded and swamp forests include 11 riparian and swamp systems comprised primarily of facultative and facultative-wetland vegetation. Although some of these systems are found at higher elevations, most are at low-to mid-elevations and are widely distributed throughout Washington. In eastern Washington, lower to mid-elevation systems are dominated by deciduous trees, while conifers tend to dominate higher elevations. Systems in western Washington have a greater mix of conifer and deciduous trees. The riparian flooded and swamp forest systems hold a special significance for Washington's fauna. Most terrestrial species have some association with riparian areas, and all anadromous and freshwater SGCN fish species are closely or generally associated with it. The condition of riparian areas has large influences on habitat conditions vital for all aquatic organisms (e.g., temperature moderation, instream structure and complexity). Note that four components of this formation are profiled as ecological systems of concern. Flooded and swamp forests are generally adapted to high moisture levels, making them vulnerable to projected climate changes in hydrology and fluvial processes resulting from precipitation shifts, reduced snowpack and earlier snowmelt, drought, and altered flow regimes. Declining summer and spring stream flows, particularly when combined with drought, could reduce available water for riparian communities, affecting seedling germination and adult survival and potentially contributing to shifts to more xeric and drought-adapted vegetation. Drought periods may exacerbate fire risk.

Formation Summary				
Distribution*	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
1,479 mi^2	33%	67%	50	56

*This Vegetation Formation is typically a narrow linear feature or small patch; such shapes are not well-suited for detection by the methods used for this project; the actual extent of this Formation is likely broader than reported.

Ecological systems found in this formation	Number of SGCN	
	closely associated	generally associated
Columbia Basin Foothill Riparian Woodland and Shrubland	10	15
Great Basin Foothill and Lower Montane Riparian Woodland	1	7
Inter-Mountain Basins Montane Riparian Systems	0	3
North Pacific Hardwood Conifer Swamp	1	14
North Pacific Lowland Riparian Forest and Shrubland	7	26
North Pacific Montane Riparian Woodland and Shrubland	2	22
North Pacific Shrub Swamp	1	11
Northern Rocky Mountain Conifer Swamp	1	8
Northern Rocky Mountain Lower Montane Riparian Woodland	6	22
Rocky Mountain Lower Montane Riparian Woodland	4	16
Rocky Mountain Subalpine Montane Riparian Woodland	3	17

Ecological System of Concern

Major Stressors

- Roads
- Urbanization
- Water diversions
- Logging
- Invasive plants
- Excessive grazing
- Agricultural crops
- Channelization and diking
- Climate Change

Habitat needs for SGCN associated with this formation

Off-channel features	Many closely associated SGCN require or are closely linked with important off-channel habitats such as springs and seeps (Cascade Torrent Salamander and a number of SGCN invertebrates) as well as stream-associated swamps and wetlands (Oregon Spotted Frog and Columbian White-tailed Deer).
High water quality	A number of closely associated SGCN, particularly invertebrates and most SGCN fishes, require waters that are cold, clean, and generally free of silt. These water quality characteristics typically are maintained by functions provided by more intact riparian areas.
High ecological integrity	A number of SGCN prefer older and mature riparian forest conditions with high canopy cover and complex structural characteristics. Closely associated SGCN that require these kinds of conditions include Rocky Mountain Tailed Frog, Cascade Torrent Salamander, Dunn's Salamander, and Puget Oregonian. Large wood contributed to streams by these riparian forests is extremely important for forming and maintaining instream habitat conditions needed for spawning and rearing by all SGCN anadromous and freshwater salmonids. Riparian wood and plant inputs to streams provide important habitat conditions for SGCN freshwater non-salmonid fishes.

Actions needed to maintain habitat quality for SGCN

- Multi-stakeholder groups determine how to manage and monitor riparian areas for multiple socioeconomic benefits
- Grazing, agriculture, and farm management (e.g., fencing livestock)
- Forest management (e., g., providing functional Riparian Management Zones)
- Urbanizing land use management: protect and maintain riparian ecosystem integrity protection.
- Habitat restoration (e.g., control invasive plants, restore connectivity, floodplain restoration)

Research and Data Needs

- Research to identify effective riparian conservation measures in arid landscapes.
- Studies on cumulative effects of land use activities within and across watersheds.
- Research in the Pacific Northwest regarding the influences of land uses beyond forestry (e.g., agriculture, urbanization) to help guide riparian management and conservation.

Ecological systems discussed in greater detail in this section include:

A. Columbia Basin Foothill Riparian Woodland and Shrubland
B. North Pacific Hardwood-Conifer Swamp
C. North Pacific Lowland Riparian Forest and Shrubland
D. Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland

Specific Ecological System References (complete list at end of chapter)

Knutson, K. L., and V. L. Naef. 1997. Management recommendations for Washington's priority habitats: riparian. Washington Department of Fish and Wildlife, Olympia, Washington.

Columbia Basin Foothill Riparian Woodland and Shrubland (ESOC)

Conservation Status and Concern

The Columbia Basin Foothill Riparian Woodland and Shrubland ecological system has been significantly degraded by historical grazing practices. This system has also decreased in extent due to agricultural development, roads, dams and other flood-control activities. Twenty-five terrestrial SGCN are associated with this system, of which 10 are closely associated species. Although a complete analysis has not been done for all SGCN anadromous and freshwater fishes, several appear closely associated with this system, e.g., Middle Columbia Steelhead DPS, Snake River Basin Steelhead DPS, and Snake River Spring/Summer Chinook Salmon ESU.

Description and Distribution

In the Columbia Plateau Ecoregion, this riparian system occurs along the middle and upper Columbia River and its tributaries. It also is widespread in the lower foothills of the East Cascade, Blue Mountain, and Okanogan Ecoregions. This system is found in low-elevation canyons and draws, on floodplains, in steep-sided canyons, and narrow V-shaped valleys with rocky substrates. Underlying gravels may keep the water table just below the ground surface and are favored substrates for black cottonwood (*Populus balsamifera*). Other trees commonly found in this riparian system are white alder (*Alnus rhombifolia)*, quaking aspen (*Populus tremuloides*), water birch (*Betula occidentalis*), and ponderosa pine (*Pinus ponderosa*).

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Riparian	S2	Imperiled/ declining Declines of 50-70% in last 50 years and from historical condition	**MAMMALS:** Hoary Bat, Silver-haired Bat, Spotted Bat, Townsend's Big-eared Bat
			BIRDS: Bald Eagle, Columbian Sharp-tailed Grouse*, Ferruginous Hawk, Golden Eagle, Lewis' Woodpecker, Loggerhead Shrike, Pygmy Nuthatch
			REPTILES/AMPHIBIANS: Columbia Spotted Frog, Northern Leopard Frog*, Rocky Mountain Tailed Frog*, Western Toad, Ring-necked Snake*, Sharp-tailed Snake*
			FISH: To be determined- research needed
			INVERTEBRATES: Columbia Clubtail*, Columbia Oregonian*, Dry Land Forestsnail, White-belted Ringtail*, Columbia Clubtail*, Mad River Mountainsnail*, Mann's Mollusk-eating Ground Beetle*, Mission Creek Oregonian, Morrison's Bumblebee

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Overharvesting of biological resources	Intentional American Beaver removal has led to loss and degradation of riparian functions.	• Native species restoration	Restore American Beaver to its historical range
Climate change and severe weather	Impacting hydrology by altering seasonal inputs of water from rainfall and snowmelt.	• Research, survey or monitoring – habitat • Partner/ stakeholder engagement	Research to identify climate change effects and to identify most vulnerable riparian areas. Re-establishment of riparian trees for shade
Agriculture and aquaculture side effects	Grazing practices have impacted structure, composition, and function. Tilling has resulted in drying of seeps and springs.	• Grazing/farm management • Land Use Planning	Encourage fencing livestock away from sensitive riparian areas. Re-establishment of riparian trees and shrubs. Support creation of GMA-based Voluntary Stewardship Plans
Dams and diversions	Greatly altering the frequency and intensity of bottomland flooding.	• Dam and barrier removal • Water management • Water rights acquisition	Remove water retention structures and encourage water conservation in agriculture to return bottomland flooding closer to historical levels. Re-establishment of riparian trees for large wood recruitment.
Invasive and other problematic species	Invasive plants like reed canary grass (*Phalaris arundinacea*) have degraded many occurrences of this system.	• Invasive species control	Encourage fencing livestock away from sensitive riparian areas, non-native eradication, and restoration of riparian tree by planting.
Roads and development	Development practices have directly impacted structure, composition and function	• Land use planning	Monitor and improve implementation of land use regulations (e.g., Growth Management Act), enhance incentives to encourage conservation measures.

Historical and contemporary land use practices have impacted hydrologic, geomorphic, and biotic structure and function of this riparian system throughout eastern Washington. A comparison of the historical and current extent shows that about 90 percent of the Columbia Basin Foothill Riparian Woodland and Shrubland ecological system in Washington has either been lost or severely degraded. Much of this is the

result of widespread land clearing for crops. Land use activities both within riparian areas as well as in adjacent uplands have fragmented many riparian reaches, which has reduced its connectivity with uplands.

Improperly managed grazing is another major influence that has altered the structure, composition, and function of this system. In general, the presence of livestock in arid riparian systems leads to less woody cover and an increase of undesirable plants. The degradation of this system also inhibits its influence on in-stream properties, such as maintaining water quality for the benefit of aquatic organisms. Although grazing and agriculture are the major stressor, this ecosystem has also been lost or degraded to the construction of roads, dams and other flood-control structures. While the widespread removal of American Beaver has harmed riparian ecosystem processes, American Beaver recolonization in the interior Columbia River Basin has led to the rapid improvement in riparian processes, structures, and quality of instream salmon habitat along incised streams. Climate change is also a concern because of this system's reliance on seasonal rainfall. Thus, increased drought frequency and duration are a concern.

Specific Ecological System References. (complete list at end of chapter)

Kauffman, J. B., A. S. Thorpe, and E. N. J. Brookshire. 2004. Livestock exclusion and belowground ecosystem responses in riparian meadows of Eastern Oregon. Ecological Applications 14: 1671-1679.

Pollock, M. M., T. J. Beechie, and C. E. Jordan. 2007. Geomorphic changes upstream of beaver dams in Bridge Creek, an incised stream channel in the interior Columbia River basin, eastern Oregon. Earth Surface Processes and Landforms 32: 1174-1185.

Sarr, D. A. 2002. Riparian livestock exclosure research in the western United States: a critique and some recommendations. Environmental Management 30: 516-526.

Trimble, S. W., and A. C. Mendel. 1995. The cow as a geomorphic agent: a critical review. Geomorphology 13: 233-253.

North Pacific Hardwood-Conifer Swamp (ESOC)

Conservation Status and Concern

Widespread logging has altered the structure and composition of most of these forested wetlands. To a lesser degree, other land uses have also impacted this system. Only a fraction of what remains has characteristics consistent with high ecological integrity. Fifteen terrestrial SGCN are associated with this system, of which only the Oregon Spotted Frog is a closely associated species.

Description and Distribution

Most occurrences of North Pacific hardwood-conifer swamps in Washington are concentrated in the Pacific Northwest Coast Ecoregion, though patches are found sporadically in the West and North Cascades Ecoregions as well as in Puget Trough. The sizes of patches are mostly small and sporadically distributed in glacial depressions, river valleys, at the edges of lakes and marshes, and on slopes where there are seeps. Examples of this system mainly occur on flat to gently sloping lowlands below 1500 feet elevation, though they are found in higher elevation forests when shallow soils occur over bedrock. This system is dominated by any one or a number of coniferous or hardwood species. Overstory canopy can be dense to relatively open (i.e. less than 50 percent). Shrub cover can also vary from dense to less than 50 percent. Soils are poorly drained while surface waters either move slowly or occur as stagnant pools. Groundwater or streams which do not experience significant overbank flooding are major contributors of water.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes (Riparian; Freshwater Wetlands - Fresh Deepwater)	S2	Imperiled/ declining Declines of 30-50 % within last 50 years. Declines of 70-80% from historic.	**MAMMALS:** Columbian White-tailed Deer, Fisher, Gray Wolf, Hoary Bat, Keen's Myotis, Silver-haired Bat, Townsend's Big-eared Bat, Western Spotted Skunk
			BIRDS: Bald Eagle, Barrow's Goldeneye, Harlequin Duck, Marbled Murrelet, Western Screech Owl
			AMPHIBIANS: Oregon Spotted Frog*, Western Toad
			FISH: To be determined- research needed

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Forestry has greatly influenced the structure, composition, and function of hardwood-conifer swamps in Washington. Most stands previously comprised of older and mature forest are now younger second-growth stands. Logging has led to establishment of younger red alder (*Alnus rubra*) dominated forest where stands once consisted of various hardwood and conifer species capable of growth in saturated or seasonally flooded soils. Similar to the effects on tree composition, logging can change the composition of understory shrubs. With logging, diverse understories have given way to a much less varied shrub layer, often dominated by salmonberry (*Rubus spectabilis*). As a secondary effect of logging, hardwood-conifer swamps have been degraded by the loss of large downed wood and snags. Logging has also negatively impacted forested swamps by altering water quality (e.g., increased nutrients and sediments), hydrology, and water temperatures, as well as microclimate. This in turn has harmed aquatic and semiaquatic species, especially those that require clean, cool water.

Beyond forestry, other land use activities have impacted the ecological integrity of this system. Agricultural development and roads have decreased the extent of this system. Because of the hydrological connections to adjacent systems, nearby land use activities can alter the ecological integrity of hardwood-conifer swamp systems. Consequently, watershed scale conservation planning as well as the use of buffers and other on-site conservation actions are important to maintaining system integrity. Exotic species, such as reed canary grass, has also threatened the ecological integrity of hardwood-conifer swamps in Washington.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Forestry impacts	Forestry has led to widespread alteration of forest composition and structure. Salmonberry responds similarly to alder and tends to dominate the understory after logging.	• Land use planning • Vegetation management	Monitor and improve implementation of land use regulations (e.g., Forest Practices Act) and expand use of incentives to ensure adequate riparian buffers. Control invasive plants and reestablish native species to restore ecological function.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Alteration of hydrology	Degraded water quality and altered hydrology resulting from land use negatively influence aquatic and semi-aquatic species.	• Land use planning	Monitor and improve implementation of land use regulations (e.g., Growth Management Act) and expand use of incentives to ensure adequate riparian buffers.
Invasive and other problematic species	Invasive species such as reed canary grass and Himalayan blackberry can take over, especially at lower elevations.	• Invasive species control	Control invasive plants and reestablish native species to restore ecological function.

Specific Ecological System References (complete list at end of chapter)

Chappell, C. B., and J. Kagan. 2001. Westside riparian-wetlands. Pages 94-96 *in* D. H. Johnson, and T. A. O'Neil, editors. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, OR.

North Pacific Lowland Riparian Forest and Shrubland (ESOC)

Conservation Status and Concern

By greatly influencing bottomland flooding, flood-control has altered the structure and composition of this lowland ecological system. Other land uses as well as ongoing threats from invasive species have also aided in the loss and degradation of this system. Thirty-three terrestrial SGCN are associated with this system, of which seven are closely associated species. Although a complete analysis has not been done for all SGCN anadromous and freshwater fishes, several appear closely associated with this system, e.g., Puget Sound Chinook Salmon ESU, Lower Columbia Chinook Salmon ESU, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU, and Columbia River Chum Salmon ESU.

Description and Distribution

North Pacific Lowland Riparian Forest and Shrublands is a linear system that occurs on low-elevation, alluvial floodplains that are confined by valleys and inlets or lower terraces of rivers and streams. This ecological system is widely distributed across lowland western Washington in the Puget Trough, Pacific Northwest Coast, and West Cascade Ecoregions. Scattered occurrences also occur in the North and East Cascades and the Columbia Plateau Ecoregions. Riverine flooding and the succession that occurs after large flood events are the major drivers of this system. Consequently, this system does not develop under stagnant hydrological regimes. North Pacific Lowland Riparian Forest and Shrubland is primarily dominated by broadleaf species such as bigleaf maple (*Acer macrophyllum*), black cottonwood, and red alder, though in the absence of major disturbances conifers tend to increase.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes Riparian	S2	Imperiled/ declining Declines of 30-50% within last 50 years and from historical condition	**MAMMALS :** Columbian White-tailed Deer*, Fisher, Gray Wolf, Hoary Bat, Keen's Myotis, Pacific Marten (coastal population), Silver-haired Bat, Townsend's Big-eared Bat, Western Gray Squirrel, Western Spotted Skunk
			BIRDS: Bald Eagle, Marbled Murrelet, Peregrine Falcon, Slender-billed White-breasted Nuthatch, Western Bluebird
			AMPHIBIANS: Cascade Torrent Salamander*, Cope's Giant Salamander, Dunn's Salamander*, Larch Mountain Salamander, Olympic Torrent Salamander, Oregon Spotted Frog*, Van Dyke's Salamander, Western Toad
			FISH: To be determined- research needed
			INVERTEBRATES: California Floater, Puget Oregonian*, Barren Juga, Brown Juga*, Three-band Juga*, Dalles Sideband, Hoko Vertigo, Dalles Hesperian, Taylor's Checkerspot, Valley Silverspot

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Historical and contemporary land use practices have significantly altered the hydrology and biotic structure and function of this riparian system. Roughly half of the historical extent of this system has been lost, while much of what remains is degraded. Land uses activities both within riparian areas as well as in adjacent uplands have fragmented the riparian corridor along most reaches of stream where this system occurs. Forestry, conversion to croplands, and urbanization are primary contributors to loss of North Pacific Lowland Riparian Forest and Shrublands in Washington. Reservoirs, water diversions, levees and other water control structures also have impacted hydrologic regimes important to maintaining this system. In particular, major flood control dams have greatly altered the frequency and intensity of bottomland flooding. This in turn has permanently inundated some areas while altering the vegetative structure and composition of others. The spread of exotic and invasive plants such as reed canary grass and blackberry have also contributed to the system's degradation. All these disturbances have compromised the habitat function of North Pacific Lowland Riparian Forest and Shrublands for terrestrial species and compromise the system's contributions to aquatic habitats and species (e.g., input of large wood to rivers and streams).

These forests and shrublands, adapted to high moisture levels and local flooding regimes driven by snowmelt and rainfall hydrology are likely to be affected by changes in hydrology and fluvial processes resulting from climate change (precipitation shifts, reduced snowpack, earlier snowmelt, drought and altered streamflow regimes).

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Dams, levees and diversions	Greatly altering the frequency and intensity of bottomland flooding.	• Dam and barrier removal • Water management • Water rights acquisition	Remove water retention structures and purchase water rights to return bottomland flooding closer to historical levels.

Forestry impacts	Logging riparian forests results in the loss of terrestrial habitat, while indirectly impacting in-stream habitat conditions.	• Environmental review • Land acquisition • Private lands agreements	Monitor and improve implementation of land use regulations (e.g., Forest Practices Act) and expand use of incentives to ensure adequate riparian management areas. Outreach to landowners to find mutual benefits.
Roads and development	Impacts hydrological regime (e.g., runoff) associated with increased impervious surfaces. Confinement of alluvial floodplains.	• Land use planning	Monitor and improve implementation of land use regulations (e.g., Growth Management Act) and expand use of incentives to ensure adequate riparian management areas.
Climate change and severe weather	Impacting hydrology by altering seasonal inputs of water from rainfall and snowmelt.	• Research, survey or monitoring – habitat • Partner/stakeholder engagement	Research to identify climate change effects and to identify most vulnerable riparian areas.
Agriculture and aquaculture side effects	Conversion to agriculture eliminates and degrades habitat	• Grazing/farm management	Support creation of GMA-based Voluntary Stewardship Plans

Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (ESOC)

Conservation Status and Concern

The integrity of this system has been compromised across much of its range by land use activities that modify annual flooding and alter vegetative structure and composition. Twenty-eight terrestrial SGCN are associated with this system, of which six are closely associated. Although a complete analysis has not been done for all SGCN anadromous and freshwater fishes, several appear closely associated with this system, e.g., Snake River Spring/Summer Chinook Salmon ESU, and Snake River Basin Steelhead DPS.

Description and Distribution

The Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland ecological system consists of deciduous, coniferous, and mixed conifer-deciduous woodlands. In Washington, this system occurs mainly on public lands along streams and in floodplains within the lower montane and foothill zones of the Canadian Rocky Mountain, Blue Mountain, and Okanogan Ecoregions. It also is found sporadically along the lower slopes in the East Cascade Ecoregion. This system is maintained by annual flooding and wet soils and can take the form of woodlands, shrublands, wet meadows, and marshes. American Beaver (*Castor canadensis*) activity is an important driver of hydrological change. Black cottonwood is the key indicator species, while several other species, including quaking aspen, paper birch (*Betula papyrifera*), and water birch can also be mixed among the canopy. Shrubs, ferns, and forbs associated with mesic conditions are also common.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes (Riparian)	S2	Imperiled/ declining Decline of 10-39% within last 50 years Declines of 30-50% from historical condition	**MAMMALS:** Fisher, Gray Wolf, Grizzly Bear, Hoary Bat, Preble's Shrew*, Silver-haired Bat, Townsend's Big-eared Bat, Western Gray Squirrel, Western Spotted Skunk
			BIRDS: Bald Eagle, Barrow's Goldeneye, Flammulated Owl, Golden Eagle, Harlequin Duck, Lewis' Woodpecker, Mountain Quail*, Peregrine Falcon, Columbian Sharp-tailed Grouse*
			AMPHIBIANS: Columbia Spotted Frog, Northern Leopard Frog*, Rocky Mountain Tailed Frog*, Tiger Salamander, Western Toad
			FISH: To be determined- research needed
			INVERTEBRATES: Mardon Skipper, Meadow Fritillary*, Morrison's Bumblebee, Mission Creek Oregonian, Idaho Vertigo

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Almost all productive floodplain riparian areas in central and eastern Washington have been put into agriculture use. Because this system occurs at low to mid-elevations, it is accessible to livestock and is highly attractive to congregating cattle. Pressure from livestock has caused both biotic and hydrologic changes to this system. These include severe changes to ecosystem composition, such as when prolonged grazing eliminates shrubs in favor of annuals such as Kentucky bluegrass. Other non-native and invasive species are brought about by grazing and by the pressures of other land uses. At stream edges, the combination of root loss and trampling from heavy grazing weakens and collapses banks. This can cause a stream to downcut, which can lower water tables and severely alter the hydrology of these riparian systems. That in turn can further change and degrade the composition and structure of the riparian vegetation.

Although not as pervasive as grazing, croplands encroachment and logging have also led to the loss and degradation of this ecological system. Changes in hydrological regime caused by dams and water diversions, tillage, and American Beaver removal have influenced the spatial extent of the system and have altered peak and based flows. These changes can have substantial effect on both riparian plants and aquatic biota.

Climate change influences riparian ecosystems due to the reliance of these systems on water. River hydrology, especially in the arid west, responds to climate change through timing changes of spring snow melt, altered flood magnitudes, and reduced summer and base flows. This can shift riparian plant communities by favoring drought-tolerant species over drought-intolerant cottonwoods that are closely associated with Northern Rocky Mountain Lower Montane Riparian Woodland and Shrublands.

Land use activities both within riparian areas as well as in adjacent uplands have fragmented many riparian reaches, which has reduced riparian-upland connectivity. Degraded riparian areas are also less able to beneficially influence adjacent streams (e.g., provide shade and large wood; uptake pollutants and excess nutrients). Consequently, watershed scale conservation planning as well as site-scale conservation measures are important to maintaining connectivity and system integrity.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Agriculture and aquaculture side effects	Grazing practices incompatible with habitat conservation has impacted habitat structure and function.	• Grazing/ farm management • Land use planning	Encourage fencing livestock away from sensitive riparian areas; restore riparian woody vegetation. Support creation of GMA-based Voluntary Stewardship Plans
Invasive and other problematic species	Invasive species become problematic when substrates are disturbed by grazing practices incompatible with habitat conservation.	• Invasive species control	Encourage fencing livestock away from sensitive riparian areas and control invasive plants and reestablish native species to restore ecological function.
Climate change and severe weather	Alteration of seasonal and annual flooding regimes will likely have adverse effects.	• Address existing stressors	Addressing existing stressors can help build resilience to climate change impacts.

Specific Ecological System References. (complete list at end of chapter)

Hultine, K. R., S. E. Bush, and J. R. Ehleringer. 2010. Ecophysiology of riparian cottonwood and willow before, during, and after two years of soil water removal. Ecological Applications 20:347-361.

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Kovalchik, B. L., and R. R. Clausnitzer. 2004. Classification and management of aquatic, riparian, and wetland sites on the national forests of eastern Washington: series description. USDA Forest Service General Technical Report PNW-GTR-593. Portland, Oregon.

Perry, L. G., D. C. Andersen, L. V. Reynolds, S. M. Nelson, and P. B. Shafroth. 2012. Vulnerability of riparian ecosystems to elevated CO2 and climate change in arid and semiarid western North America. Global Change Biology 18: 821-842.

Poff, B. K., A. Karen, D. G. Neary, and V. Henderson. 2011. Threats to Riparian Ecosystems in Western North America: An Analysis of Existing Literature. Journal of the American Water Resources Association 47:1241-1254.

Wissmar, R. C. 2004. Riparian corridors of eastern Oregon and Washington: functions and sustainability along lowland-arid to mountain gradients. Aquatic Sciences 66: 373-387

FRESHWATER AQUATIC VEGETATION, WET MEADOW, AND MARSH

Overview

The freshwater aquatic vegetation, wet meadow, and marsh vegetation formation includes 22 ecological systems comprised mainly of native herbaceous vegetation. Associated ecological systems occur at a broad range of elevations, climate conditions, and are widely distributed throughout Washington. They mostly occur in small patches, found primarily where there are hydric soils. Many of these systems are made up of diverse plant communities and are used by a wide range of Washington's SGGN. The wet meadow and marsh systems that occur in arid parts of the state are particularly important as refuge for native fauna during dry summer periods. Washington has lost an estimated 31 percent of its 1.35 million acres of wetlands. Although many wetlands that remain are of high ecological quality, others occur in a degraded state. Note that five components of this formation are profiled as ecological systems of concern.
Climate changes such as drought, increasing temperatures, and changes in precipitation type, timing, and amount that alter hydrologic regimes and rates of evaporation and recharge may have significant impacts in wetland habitats. For example, these climate changes could lead to wetland drying, shifts in species assemblages (native and non-native), habitat conversion, and/or decreased quality and quantity of habitat available for aquatic biota. Changes in winter precipitation type and timing, as well as earlier runoff, could positively (e.g., create side channels or additional habitat) or negatively (e.g., reduced opportunities for water storage and recharge, increased erosion) impact these habitats.

The ecological system with the largest number of associated species in this formation is Temperate Pacific Freshwater Aquatic Bed. Specifically, a large group in this association are aquatic invertebrates, including snails, flies, stoneflies, and mussels. They form one of the largest assemblages of closely associated species within a single ecological system in Washington. There are nine ecological systems of concern in this formation, five of which are discussed in greater detail below:

Formation Summary				
Distribution*	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
559 mi^2	11%	89%	44	67

*This Vegetation Formation is typically a narrow linear feature or small patch; such shapes are not well-suited for detection; the actual extent of this Formation is likely broader than reported.

Ecological systems found in this formation	Number of SGCN	
	closely associated	generally associated
Columbia Plateau Vernal Pool	3	5
Modoc Basalt Flow Vernal Pool	0	1
North American Arid West Emergent Marsh	8	12
North Pacific Avalanche Chute Shrubland	0	9
North Pacific Coastal Interdunal Wetland	4	0
North Pacific Intertidal Freshwater Wetland	3	7
Northern Columbia Plateau Basalt Pothole Pond	1	1
Northern Rocky Mountain Avalanche Chute Shrubland	0	4
Rocky Mountain Alpine Montane Wet Meadow	3	9
Rocky Mountain Subalpine Montane Riparian Shrubland	0	11
Temperate Pacific Freshwater Aquatic Bed	17	12

Temperate Pacific Freshwater Emergent Marsh	5	16
Temperate Pacific Freshwater Mudflat	2	3
Temperate Pacific Montane Wet Meadow	3	9
Willamette Valley Wet Prairie	8	8

☐ Ecological System of Concern

Major Stressors

- Dams and water management/use
- Invasive plants
- Pollution and degraded water quality
- Change in water quantity, timing due to changes in uplands (e.g., urbanization)
- Excess pressure from agriculture and grazing
- Loss of connectivity with uplands
- Climate Change
- Over-pumping of groundwater

Habitat needs for SGCN associated with this vegetation formation

Open habitat	Several amphibians (Oregon Spotted Frog, Western Pond Turtle, and Northern Leopard Frog) closely associated with some Freshwater Wet Meadow and Marsh ecological systems require open habitats with understory vegetation of low stature so eggs and egg masses will be exposed to sufficient sunlight.
High ecological integrity	The same amphibians that need open habitat are negatively affected by predators such as warm water fishes or American Bullfrogs (*Lithobates catesbeiana*) and when wetlands are invaded by aggressive plants such as reed canary grass or plants such as the native broadleaf cattail (*Typha latifolia*) that may become aggressive when alterations to hydrology, nutrient and sediment regime produce an environment conducive to forming monotypic stands. Olympic Mudminnow and Tui Chub are likely closely associated with this system and require its ecological integrity throughout their life cycles.
High habitat connectivity	A number of closely associated SGCN have low mobility. Because many of these same species also require different types of habitats in close proximity to one another, wetlands with few barriers to adjacent uplands are preferred.

Actions needed to maintain habitat quality for SGCN

- Invasive plant and animal control.
- Habitat restoration and native plant restoration.
- Maintenance and/or restoration of a close approximation of system's natural hydrology.

Research and Data Needs

- Information on the effects of agricultural practices on wetland functions in the Pacific Northwest, especially in eastern Washington, is limited.
- Studies have examined whether projects using compensatory wetland mitigation met performance standards. However, few studies explore why performance standards are not met.
- Research on cumulative impacts to wetlands is mainly addressed from the perspective of direct wetland losses, and less from the perspective of degraded wetlands.
- Research on the effectiveness of wetland regulations and wetland rating systems for conserving species and important wetland functions and processes.

- Continue biennial updates to the High Resolution Change Detection dataset for the Puget Sound basin; expand the analysis to include ESOCs and Priority Habitats statewide.

Ecological systems and other habitats discussed in greater detail in this section include:

A. Temperate Pacific Freshwater Mudflat
B. North Pacific Intertidal Freshwater Wetland
C. North American Arid West Emergent Marsh
D. Willamette Valley Wet Prairie
E. Temperate Pacific Freshwater Emergent Marsh

Specific Ecological System References (complete list at end of chapter)

Dahl, T. E. 1990. Wetland losses in the United States 1780's to 1980's. U. S. Fish and Wildlife Service, Washington, DC, USA.

North American Arid West Emergent Marsh (ESOC)

Conservation Status and Concern

North American Arid West Emergent Marshes provide important habitat for many migratory water birds as well other species that require shallow waters. They are also a particularly valuable source of moist habitat for fauna during dry summer periods in arid landscapes. Although a widespread system, almost all occurrences are degraded ecologically from their historical condition. Twenty terrestrial SGCN are associated with this system, eight of which are closely associated species. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

North American Arid West Emergent Marshes are widespread below the lower tree-line throughout the Columbia Plateau, and along the lower portions of the Canadian Rocky Mountain, and Okanogan Ecoregions. Typically represented as small wetland patches surrounded by savanna, shrub-steppe, or meadow-steppe vegetation, occurrences are sporadically distributed, mostly within depressions (e.g., ponds), along lake fringes, and near slow-flowing rivers and streams. Water chemistry can be highly variable, even within the same wetland complex, and soils have hydric characteristics. Marshes are frequently inundated to water depths of up to six feet. For most of the growing season water can be found at or above the surface, although soils can become exposed by late summer. Plants adapted to waterlogged substrates dominate these wetlands and common emergent and floating vegetation include species of sedge, bulrush, rushes, pondweed, and pond-lily.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes (Freshwater Wetlands - Fresh Deepwater)	S2	Imperiled/ declining Declines of 30-50% within last 50 years and from historical condition	**MAMMALS:** Hoary Bat, Kincaid Meadow Vole*, Silver-haired Bat, Spotted Bat, Townsend's Big-eared Bat
			BIRDS: American White Pelican, Bald Eagle, Barrow's Goldeneye, Cinnamon Teal*, Common Loon, Marbled Godwit, Peregrine Falcon*, Red-necked Grebe, Short-eared Owl, Upland Sandpiper*
			AMPHIBIANS: Columbia Spotted Frog, Northern Leopard Frog*, Tiger Salamander*, Woodhouse's Toad*

			FISH: To be determined- research needed
			INVERTEBRATES: Silver-bordered Fritillary*

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

A variety of land use activities and stressors have negatively impacted this system. They range from development, grazing and agriculture, roads, invasive species, as well as the availability and quality of water. Grazing, invasive species, especially reed canary grass, and altered hydrology have degraded almost every occurrence of this system in the Columbia Basin. Grazing practices that are incompatible with habitat conservation is a likely reason for the decreased abundance of native sedges and grasses, and an increase of invasive plants. Land use disturbance in contributing watersheds can contribute excess nutrients to marshes, which can also aid in the spread of invasive plants. Land use activities both within marshes as well as in adjacent uplands have likely reduced connectivity between wetland and upland habitats. American Bullfrogs are common to the Columbia Basin Ecoregion and likely occur in this marsh system. As severe droughts and air temperatures increase as a result of climate change, this will likely put further stress on this ecological system (e.g., wetlands drying out).

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Agriculture and aquaculture side effects	Spread of invasive plant species, particularly through grazing practices that are incompatible with habitat conservation.	• Invasive species control • Grazing/farm management • Private lands agreements • Land use planning	Control invasive plants to maintain native species and restore ecological functions. Work with landowners to exclude livestock from marshes. Support creation of GMA-based Voluntary Stewardship Plans.
Alteration of hydrology	Hydrological alterations have reduced habitat quantity, quality, and availability.	• Water management • Water rights acquisition • Grazing/farm management • Private lands agreements	Remove water retention structures and possible purchase of water rights to minimize loss of groundwater.
Climate Change and severe weather	Sensitive to increasing temperatures and changes in precipitation type, timing, and amount.	• Research, survey or monitoring - habitat	Activities to restore ecological function.
Roads and development	Development practices have directly impacted structure, composition and function.	• Land use planning	Monitor and improve implementation of land use regulations (e.g., Shoreline Management Act), enhance incentives to encourage conservation measures.

Specific Ecological System References (complete list at end of chapter)

Hallock, L. A., and K. R. McAllister. 2009. American Bullfrog. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

North Pacific Intertidal Freshwater Wetland (ESOC)

Conservation Status and Concern

Hydrological modifications, especially those which alter tidal exchange, have negatively affected the ecological processes and species associated with this system. This and other disturbances such as the spread of invasive plants have contributed to significant declines in spatial extent and ecological integrity of North Pacific Intertidal Freshwater Wetlands in Washington. Ten terrestrial SGCN are associated with this system, of which the Columbian White-tailed Deer, Peregrine Falcon and Taylor's Checkerspot are closely associated. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

North Pacific Intertidal Freshwater Wetland is a small-patch, tidally influenced freshwater ecological system that forms as narrow strips as well as more extensive patches of habitat. It occurs primarily in the Puget Trough and Pacific Northwest Coast Ecoregions. More specifically occurrences are found in bays and inlets of Washington's southern outer coast, at outlets of large rivers that discharge into Puget Sound (e.g., Skagit River Delta), and along the Columbia River and its tributaries downstream of Bonneville Dam. Although little detailed vegetation data has been collected for this system, plants communities are complex and can include patches dominated by trees, shrubs or herbaceous species.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes (Freshwater Wetlands - Fresh Deepwater)	S1	Critically imperiled/ declining Decline of 50-70% within last 50 years and from historical condition	**MAMMALS :** Columbian White-tailed Deer*, Hoary Bat, Silver-haired Bat, Townsend's Big-eared Bat
			BIRDS: Peregrine Falcon*, Bald Eagle, Barrow's Goldeneye, Red–necked Grebe, Greater Sandhill Crane
			FISH: To be determined- research needed
			INVERTEBRATES: Oregon Silverspot, Taylor's Checkerspot*

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

An estimated 90 percent of Puget Sound freshwater tidal wetlands have been lost, while lesser but still significant losses are documented in the Columbia River System. Hydrological modifications, especially those that alter tidal exchange (e.g., jetties, dikes, and dams) have contributed to these losses. Direct alterations of hydrology (i.e., channeling, draining, damming) as well as indirect alterations (e.g., roads on adjacent slopes) have likely also changed the locations of these types of wetlands. Water control structures have degraded the ecological processes and species composition linked to this system by substantially altering the processes that maintain this system. Where there have been long term changes in flow, these wetlands have sometimes reestablished to reflect the new hydrology (e.g., broadleaf cattail can be an aggressive invader).

Although urbanization adjacent to and harvesting timber in wetlands is now regulated, many occurrences were historically filled during urbanization or logged. Urbanization, logging, filling, and other activities within wetlands as well as in adjacent uplands have likely also reduced wetland connectivity with upland habitat. Most remaining occurrences of North Pacific Intertidal Freshwater Wetlands are degraded to some extent by invasive weeds, such as reed canary grass, giant knotweed (*Polygonum sachalinense*), and purple loosestrife (*Lythrum salicaria*).

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Dams, levees and diversions	Hydrological alterations (especially those which alter tidal exchange)	• Dam and barrier removal • Hazard removal • Instream modification	Restore hydrological processes by removing or modifying in-stream and near shore barriers inhibiting historical hydrological regime
Fish and wildlife habitat loss or degradation	Reduced connectivity with uplands	• Dam and barrier removal • Create new habitat or natural processes • Land use planning	Remove barriers inhibiting habitat connectivity to restore ecological function. Retain, re-establish low intensity land uses adjacent to wetlands.
Invasive and other problematic species	Invasive plants	• Invasive species control	Control invasive plants and reestablish native species to restore ecological function.
Roads and development	Direct loss (filling) of habitat; degradation of ecosystem processes	• Land use planning	Monitor and improve implementation of land use regulations (e.g., Shoreline Management Act) and stormwater regulations, enhance incentives to encourage Low Impact Development techniques and other conservation measures.

Specific Ecological System References (complete list at end of chapter)

Fresh K., M. Dethier, C. Simenstad, M. Logsdon, H. Shipman, C. Tanner, T. Leschine, T. Mumford, G. Gelfenbaum, R. Shuman, and J. Newton. 2011. Implications of Observed Anthropogenic Changes to the Nearshore Ecosystems in Puget Sound. Prepared for the Puget Sound Nearshore Ecosystem Restoration Project. Technical Report 2011-03.

Marcoe, K., and S. Pilson. 2012. Land cover change in the Lower Columbia River Estuary, 1880 – 2011. Poster presented at The Columbia River Estuary Conference. May 15 to 17, 2012, Astoria, Oregon.

Temperate Pacific Freshwater Emergent Marsh (ESOC)

Conservation Status and Concern

Although Temperate Pacific Freshwater Emergent Marshes remain widespread on the landscape, much, if not most of it is in a degraded condition. The system has also likely experience significant decline in its extent in Washington. Twenty-one terrestrial SGCN are associated with this system, five of which are

closely associated species. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

Dominated by herbaceous vegetation, this system occurs as small patches mainly in lowlands. In Washington, Temperate Pacific Freshwater Emergent Marshes are most abundant in the Puget Trough Ecoregion, though it occurs throughout the Pacific Northwest Coast and North Cascades Ecoregions and in sporadic locations across the foothills of the East and West Cascades. This freshwater system ranges from seasonally to permanently flooded wetlands found in depressions, along streams, and shorelines. A consistent freshwater source is essential to the function of this system. Therefore, waters generally remain at or above the surface, though water levels can radically fluctuate and by late summer bare soil can become exposed. Waters are nutrient rich, which favor aggressive species and low plant species diversity. Vegetation is frequently made up of graminoids (e.g., grasses, sedges, rushes), though forbs can be present. Trees, shrubs and non-vascular plants are typically absent or sparse.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Freshwater Wetlands, Freshwater Deepwater	S2	Imperiled/ declining Decline of 10 to 30% within last 50 years and from historical condition	**MAMMALS:** Columbian White-tailed Deer, Hoary Bat, Keen's Myotis, Shaw Island Vole, Silver-haired Bat, Townsend's Big-eared Bat
			BIRDS: Bald Eagle, Barrow's Goldeneye, Cinnamon Teal*, Dusky Canada Goose, Harlequin Duck, Peregrine Falcon*, Purple Martin, Greater Sandhill Crane, Short-eared Owl
			REPTILES/AMPHIBIANS: Columbia Spotted Frog, Oregon Spotted Frog*, Tiger Salamander*, Western Toad, Western Pond Turtle*
			FISH: To be determined- research needed
			INVERTEBRATES: A caddisfly species (*Limnephilus flavastellus*)

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Although most wetlands now receive regulatory protections, historical filling and draining certainly led to the direct loss of these wetlands. In addition to direct losses, alterations to this system have occurred from activities like diking, urban development, and agricultural. Given that a high concentration of these wetlands are in populous regions of the state, urban development pressures have certainly taken a toll on this ecological system. Such influences include altered hydrology associated with runoff over impervious surfaces. It also includes the flush of nutrients and toxic contaminants into wetlands from roads and development.

Development has also fragmented these wetlands from other nearby wetlands as well as from adjacent uplands. Similar to other types of wetlands, many Temperate Pacific Freshwater Emergent Marshes are degraded by invasive plants. Broadleaf cattail is a native species that can become a particularly problematic invader when ecological conditions have been altered. With the spread of American Bullfrogs throughout the lowlands of Washington, especially in the Puget Sound Region, this non-native predator is now common to marsh systems in this region. Conversely, the widespread trapping of American Beaver has diminished the positive role that this species used to play in creating and maintaining wetlands throughout the state.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Invasive and other problematic species	Invasive plants	• Invasive species control	Control invasive plants and reestablish native species to restore ecological function.
Invasive and other problematic species	American Bullfrog use of wetland.	• Invasive species control	Control American Bullfrogs, especially where they coexist with vulnerable SGCN.
Roads and development	Impacts hydrological regime (e.g., runoff) associated with increased impervious surfaces. Confinement of alluvial floodplains.	• Land use planning	Monitor and improve implementation of land use regulations (e.g., Growth Management Act) and stormwater regulations, enhance incentives to encourage Low Impact Development techniques and other conservation measures.

Specific Ecological System References (complete list at end of chapter)

Hallock, L. A., and K. R. McAllister. 2009. American Bullfrog. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

MacKenzie, W. H., and J. R. Moran. 2004. Wetlands of British Columbia: a guide to identification. Research Branch, B.C. Ministry of Forestry, Victoria, British Columbia.

Temperate Pacific Freshwater Mudflat (ESOC)

Conservation Status and Concern

Temperate Pacific Freshwater Mudflat ecological systems provide important habitat, especially as a migratory stopover for shorebirds to rest and feed. This ecological system has decreased from its historical extent in Washington, primarily because of a significantly altered flooding regime. Five terrestrial SGCN are associated with this system, of which only the Cinnamon Teal and Columbia River Tiger Beetle are closely associated. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

This small patch system ranges from sparsely vegetated to extensive sods of herbaceous vegetation. The system occurs in seasonally flooded shallow floodplain mudflats, especially along the estuarine waters of the lower Columbia River in the Pacific Northwest Coast Ecoregion. Plants supported by these mudflats typically are annuals of low stature.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes (Freshwater Wetlands - Fresh Deepwater)	S1	Critically imperiled. Decline of 50-70% in last 50 years and from historical condition	**BIRDS:** Bald Eagle, Cinnamon Teal*, Dusky Canada Goose, Peregrine Falcon **FISH**: To be determined- research needed **INVERTEBRATES:** Columbia River Tiger Beetle*

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Hydrological alterations in the upper Columbia River drainage (e.g., large mainstem river dams) have likely decreased the extent of this system due to reduced sediment loads carried downstream and because of changes in flooding regime. River bottom dredging has also likely removed the sediment source required to maintain mudflats, while non-native species has also impacted the system.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Energy development and distribution	Hydropower alters frequency and intensity of bottomland flooding and sediment inputs.	• Water management	Negotiations with dam operators during relicensing to influence ecosystem.
Invasive and other problematic species	Excess nutrients lead to establishment of non-native or invasive plants.	• Invasive species control • Planting/seeding	Removing invasive flora.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Fish and wildlife habitat loss or degradation	Dredging activities can result in removal of sediments needed for mudflat development and maintenance.	• Create new habitat or natural processes • Living shorelines	Work with Corps of Engineers on mudflat restoration (e.g., creating new mudflats with dredging spoils).
Roads and development	Alteration of sediment regime has indirectly impacted structure, composition and function	• Land use planning	Monitor and improve implementation of land use regulations (e.g., Shoreline Management Act), enhance incentives to encourage conservation measures.

Willamette Valley Wet Prairie (ESOC)

Conservation Status and Concern

The Willamette Valley Wet Prairie ecological system has been nearly extirpated in Washington. Sixteen terrestrial SGCN are associated with this system; eight species are closely associated. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

This system is mainly restricted to oak/prairie landscapes of South Puget Sound as well as parts of Lewis, Cowlitz, and Clark Counties (hereafter referred to as Willamette Valley). Wet prairie is dominated by a highly diverse community of grasses and sedges and to a lesser degree by forbs or shrubs. In fire-maintained prairie landscapes, wet prairies occur in areas with seasonally high water tables. Although likely extirpated, South Puget Sound wet prairie occurred in low-lying sites with open topography and few barriers to isolate them from historically frequent fires. In the permeable, glacial outwash substrates of the region, wet prairies were most likely limited to swales and along low-gradient riparian areas where aquafers were perched close to the surface. The wet prairies of South Puget Sound contrast with Willamette Valley wet prairies, in that the latter generally occurs on fairly impermeable, clay-rich soils. Although Willamette Valley wet prairie once covered a large area, it now is likely restricted to scattered small patches of habitat.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Westside Prairie	S1	Critically imperiled/ declining Declines of >90% in last 50 years and from historical condition	**MAMMALS:** Brush Prairie Pocket Gopher, Silver-haired Bat, Townsend's Big-eared Bat, Mazama Pocket Gopher
			BIRDS: Bald Eagle, Cinnamon Teal, Oregon Vesper Sparrow, Short-eared Owl, Streaked Horned Lark*, Western Bluebird*
			FISH: To be determined- research needed
			INVERTEBRATES: Taylor's Checkerspot*, Oregon Branded Skipper*, Mardon Skipper*, Sonora Skipper*, Puget Sound Fritillary*, Valley Silverspot*

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

In the wet prairie swales of the South Puget Sound, relatively high site productivity resulted in their rapid conversion to agricultural use, intense grazing pressure from livestock, and rapid invasion by dense, woody vegetation in the absence of regular fires. In addition, the hydrology of many sites has been altered by draining, agriculture, roads, recession of the ground water table (due to wells), and lack of fire. As a result, native prairie vegetation in wet prairie swale habitat has been extirpated in South Puget Sound and may be close to meeting the same fate in southwest Washington.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Fish and wildlife habitat loss or degradation	Habitat is nearly extirpated from Washington	• Private lands agreements • Conservation area designation • Land acquisition • Habitat restoration • Land use planning	Apply regulatory (e.g., low intensity land uses) and non-regulatory (e.g., conservation easements) tools to protect known extant wet prairie locations.
Resource information collection needs	Insufficient knowledge of the location of remaining wet prairie habitat, especially on private lands, where access is limited.	• Research, survey or monitoring - habitat	Identify extent of remaining wet prairie by gaining access to sites with likelihood of locating habitat.

Specific Ecological System References (complete list at end of chapter)

Altman, B., M. Hayes, S. Janes, and R. Forbes. 2001. Wildlife of westside grassland and chaparral habitats. Pages 261-291 *in* D. H. Johnson and T. A. O'Neil, Managing Directors. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Caplow, F., and J. Miller. 2004. Southwestern Washington prairies: using GIS to find rare plant habitat in historic prairies. Washington Department of Natural Resources, Olympia, Washington.

Chappell, C. B., E. A. Alverson, and W. R. Erickson. 2004. Ecologic and geographic variation in species composition of prairies, herbaceous balds, and oak woodlands of the Willamette Valley-Puget Trough-Georgia Basin Ecoregion. Abstract: Ecological Society of America, August 1 - 6, 2004, Portland Convention Center, Oregon.

Easterly, R. T., D. L. Salstrom, and C. B. Chappell. 2005. Wet prairie swales of the South Puget Sound, Washington. Report prepared for The Nature Conservancy, South Sound Office, Olympia, Washington.

GRASSLAND, MEADOW, AND SHRUBLAND

Overview

Grasslands, meadows, and shrublands include 12 ecological systems comprised of native upland vegetation throughout a broad elevational and climactic range in Washington. They vary from dry subalpine grasslands to prairies to western Washington balds and bluffs, to deciduous shrublands and subalpine meadows to dry canyon grasslands and prairies of eastern Washington. They do not include ecological systems associated with deserts, wetlands, alpine, disturbed, urban, coastal dune and tidal vegetation. Note that three components of this formation are profiled as ecological systems of concern.

The ecological system with the greatest number of associated SGCN in this formation is Willamette Valley Upland Prairie and Savanna, with 17 closely associated species (see below), followed by North Pacific Herbaceous Bald and Bluff. A number of SGCN butterflies are closely associated with North Pacific Herbaceous Bald and Bluff, including the Great Arctic, Hoary Elfin, Propertius Duskywing, Oregon branded Skipper, Puget Sound Fritillary, Sonora Skipper, Taylor's Checkerspot and Valley Silverspot.

Formation Summary				
Distribution	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
3,713 mi^2	46%	54%	30	56

Ecological systems found in this formation	Number of SGCN	
	closely associated	generally associated
Columbia Basin Foothill and Canyon Dry Grassland	4	26
Columbia Basin Palouse Prairie	3	11
North Pacific Alpine and Subalpine Dry Grassland	7	7
North Pacific Herbaceous Bald and Bluff	8	3
North Pacific Hypermaritime Shrub and Herbaceous Headland	2	3
North Pacific Montane Shrubland	0	10
Northern Rocky Mountain Lower Montane Foothill and Valley	1	14
Northern Rocky Mountain Montane Foothill Deciduous Shrubland	3	11
Northern Rocky Mountain Subalpine Deciduous Shrubland	1	7
Northern Rocky Mountain Subalpine Upper Montane Grassland	2	6
Rocky Mountain Subalpine Montane Mesic Meadow	2	13
Willamette Valley Upland Prairie and Savanna	15	8

☐ Ecological System of Concern

Major stressors

Wildlife habitat loss and degradation, invasive plants and animals (including invading native species), fire suppression and climate change.

Habitat needs for SGCN associated with this vegetation formation

Deep soils	Several species (Mazama Pocket Gopher, Olympic Marmot, American Badger, Western Pond Turtle) require soils that are relatively deep and suitable for burrowing. These species also provide natural disturbance in grassland habitats. Deep soil habitats are more suitable for agriculture and are sensitive to accelerated succession due to fire suppression and climate change.
High micro-climate diversity	Many of the butterflies use habitat of high microclimate diversity with few invasive plants and high diversity of native plants.
High ecological integrity	Some of the birds (Streaked Horned Lark, Oregon Vesper Sparrow) and butterflies (Taylor's Checkerspot, Mardon Skipper, Oregon Branded Skipper, Sonora Skipper) require short-stature vegetation provided by native species, and are sensitive to invasive shrubs and grasses. Ecological integrity of this habitat's riparian areas is important for SGCN interior Columbia Basin anadromous salmonids and freshwater fishes.

Actions needed to maintain habitat quality for SGCN

- Fire management (establishment of natural fire regimes and prescribed fire)
- Grazing, agriculture, and farm management
- Invasive species control
- Habitat restoration, research, and native species restoration)
- Continue biennial updates to the High Resolution Change Detection dataset for the Puget Sound basin; expand the analysis to include ESOCs and Priority Habitats statewide.

Ecological systems discussed in greater detail in this section

Of the 12 ecological systems found in this formation, the following three are ecological systems of concern, and discussed in greater detail.

A. Columbia Basin Foothill and Canyon Dry Grassland
B. Columbia Basin Palouse Prairie
C. Willamette Valley Upland Prairie and Savanna

Columbia Basin Foothill and Canyon Dry Grassland (ESOC)

Conservation Status and Concern

Columbia Basin Foothill and Canyon Dry Grasslands occur over 1,450 square miles in eastern Washington. Degradation in condition is the major cause of conservation need. Cheatgrass (*Bromus tectorum*) and other annual bromes are widespread on south aspects. Exotic weeds also commonly invade this system on the north aspects.

Description and Distribution

Columbia Basin Foothill and Canyon Dry Grassland ecological systems occur on steep open slopes, from 300 to 5000 feet elevation in the canyons and valleys of the Columbia Plateau Ecoregion, particularly along the Snake River canyon and large tributaries. It typically occurs at and well below lower treeline. It is floristically similar to the Columbia Basin Palouse Prairie but is distinguished by landform, soil, and process characteristics. Perennial bunchgrasses and forbs (usually over 25 percent cover) dominate these grasslands. Annual precipitation is low (5 to 10 inches) and occurs mostly in the winter, primarily as rain.

Fire frequency is presumed to be less than 20 years; the return interval may have been as low as 5 to 10 years. Elk, deer and bighorn sheep are native large grazers in the canyon who used particularly in winter and spring.

There are four terrestrial SGCN that are considered closely associated with this ecological system, three birds and one reptile. An additional 25 terrestrial species are generally associated with this system. Although a complete analysis has not been done for all SGCN anadromous and freshwater fishes, several appear closely associated with this system, e.g., Snake River Basin Steelhead DPS, and Snake River Spring/Summer Chinook Salmon ESU.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Eastside Steppe	S1-S2	Imperiled/ declining Decline of 30 – 50% in last 50 years Decline of >90% from historical conditions	**MAMMALS:** American Badger, White-tailed Jackrabbit, Washington Ground Squirrel, Townsend's Big-eared Bat, Spotted Bat, Silver-haired Bat, Merriam's Shrew, Hoary Bat
			BIRDS: Bald Eagle, Mountain Quail, Loggerhead Shrike, Short-eared Owl, Peregrine Falcon, Columbian Sharp-tailed Grouse*, Ferruginous Hawk*, Burrowing Owl, Golden Eagle*
			REPTILES/AMPHIBIANS: Columbia Spotted Frog, Desert Nightsnake, Ring-necked Snake*, Side-blotched Lizard**,** Tiger Salamander, Western Toad
			FISH: To be determined- research needed
			INVERTEBRATES: Morrison's Bumblebee, Poplar Oregonian, Hoder's Mountainsnail, Ranne's Mountainsnail, Limestone Point Mountainsnail, a mayfly species (*Paraleptophlebia jenseni*)

*SGCN closely associated with this ecosystem.

Stressors and Actions Needed

Two important attributes not mentioned above are the relative cover of native bunchgrass and condition of the biological soil crust. The primary land uses that alter the natural processes of this system are associated with livestock practices, annual exotic species invasion, fire regime alteration, direct soil surface disturbance, and fragmentation. Excessive grazing stresses the system through soil disturbance, diminishing or eliminating the biological soil crust, altering the composition of perennial species, and increases the establishment of annual grasses, particularly cheatgrass and other exotic annual bromes. Increasing habitat quality is the primary action needed to restore ecological integrity.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Altered disturbance regimes	Fire exclusion has resulted in shrub encroachment, loss of habitat diversity	• Fire management • Vegetation management	Integrated Habitat Restoration using prescribed fire, weed control and seeding with natives
Invasive/other problematic species	Invasive forbs and shrubs are degrading native grassland	• Invasive species control	Mechanical and herbicide control of exotics

Agriculture and aquaculture side effects	Excessive grazing and accelerating weed invasions	• Grazing/farm management • Invasive species control • Planting/seeding • Private lands agreements • Land use planning	Conservation easements, landowner agreements, and restoration. Integrated habitat restoration using prescribed fire, weed control and seeding with natives Support creation of GMA-based Voluntary Stewardship Plans

Specific Ecological System References (complete list at end of chapter)

Tisdale, E.W. 1986. Canyon grasslands and associated shrublands of west-central Idaho and adjacent areas. Bulletin 40. Forestry, Wildlife and Range Experiment Station, University of Idaho, Moscow.

Columbia Basin Palouse Prairie (ESOC)

Conservation Status and Concern

This once extensive grassland is now limited to small patches, as over 90 percent of the original prairie was converted to agricultural uses. The remaining patches remain subject to weed and native shrub invasion.

Description and Distribution

The Columbia Basin Palouse Prairie ecological system was once an extensive grassland system within the Columbia Plateau Ecoregion in southeast Washington and adjacent Idaho and Oregon. It was characterized by dense bunchgrass cover on a dune-like topography composed of loess hills and plains over basalt informally called the Palouse loess. Remnant prairies are now typically associated with small, steep and rocky sites or small, isolated sites within an agricultural landscape. The associated climate of the Palouse Prairie is generally warm to hot, dry summers and cool, wet winters. Annual precipitation is high, (15 to 30 inches) and the soils were typically deep, well-developed, and old.

There are three terrestrial SGCN that are considered closely associated with this ecological system. They are all birds (see table below). An additional 11 terrestrial species are generally associated with this system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Eastside Steppe	S1	Critically imperiled/ declining Decline of 10-30% within the last 50 years. Decline of >90% from historical condition	**MAMMALS:** Hoary Bat, Silver-haired Bat, Townsend's Big-eared Bat, White-tailed Jackrabbit, American Badger, Washington Ground Squirrel
			BIRDS: Columbian Sharp-tailed Grouse*, Ferruginous Hawk*, Golden Eagle*, Short-eared Owl, Peregrine Falcon, Burrowing Owl, Cinnamon Teal
			AMPHIBIANS: Tiger Salamander
			FISH: To be determined- research needed
			INVERTEBRATES: Giant Palouse Earthworm*

* SGCN is closely associated with this ecological system

Key Stressors and Actions Needed

The primary land uses that alter the natural processes of the Columbia Plateau Palouse Prairie system are associated with agricultural and livestock practices, exotic species, fire regime alteration, direct soil surface disturbance, and fragmentation. Fire further stresses livestock-altered vegetation by increasing exposure of bare ground and consequent increases in exotic annuals and decrease in perennial bunchgrass. Fire suppression leads to deciduous shrubs, such as snowberry (*Symphoricarpos* spp.), ninebark (*Physocarpus malvaceus*), oceanspray (*Holodiscus discolor*), and currant (*Ribes* spp.) and in some areas ponderosa pine and Douglas-fir (*Pseudotsuga menziesii*).

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Agriculture and aquaculture side effects	Conversion to agriculture eliminates and degrades habitat	• Land use planning • Grazing/farm management	Support creation of GMA-based Voluntary Stewardship Plans
Altered disturbance regimes	Fire exclusion has resulted in shrub encroachment, loss of habitat diversity	• Fire management • Invasive species control	Integrated Habitat Restoration using prescribed fire, weed control and seeding with natives
Invasive and other problematic species	Invasive forbs and shrubs are degrading native grassland	• Fire management • Invasive species control	Mechanical and herbicide control of exotics

Willamette Valley Upland Prairie and Savanna (ESOC)

Conservation Status and Concern

Due to historical losses in habitat, and ongoing threats from invasive species and development, conservation action is critical for conservation of this ecological system and associated SGCN. There are 15 terrestrial SGCN considered as closely associated with this ecological system (see table below). There are an additional eight terrestrial species that are considered generally associated with this ecological system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

The Willamette Valley Upland Prairie and Savanna is a grassland and savanna system endemic to the Willamette Valley Ecoregion and Puget Lowlands. In Washington, it is most expansive in the south Puget Sound (e.g., Pierce and Thurston Counties) and is also found in the San Juan Islands and in southwestern Washington. Most sites experience extreme soil drought in the summer. In the South Puget Sound, this system occurs as large patches, usually associated with deep, gravelly/sandy glacial outwash that is excessively well drained within more forested landscapes. Landforms are usually flat, rolling, or gently sloping, and often part of extensive plains.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes Westside Prairie	S1	Critically imperiled, declining	**MAMMALS:** Mazama Pocket Gopher*, Western Gray Squirrel, Townsends Big-eared Bat, Silver-haired Bat, Hoary Bat, Brush Prairie Pocket Gopher

		Decline of 30% within the last 50 years. Decline of > 90% from historical condition	**BIRDS:** Streaked Horned Lark*, Oregon Vesper Sparrow*, Western Bluebird*, Short-eared Owl, Bald Eagle
			REPTILES/AMPHIBIANS: Western Pond Turtle*, Western Toad
			FISH: To be determined- research needed
			INVERTEBRATES: Taylor's Checkerspot*, Mardon Skipper*, Puget Blue*, Valley Silverspot*, Puget Sound Fritillary*, Sonora Skipper*, Island Marble*, Oregon Branded Skipper*, Propertius' Duskywing*, Hoary Elfin*

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

The exclusion of fire from most of this system over the last 100-plus years has resulted in the loss of oak savanna from the landscape and the encroachment of Douglas-fir, except perhaps on the very driest sites. This encroachment leads to the conversion of prairies and savannas to forests. Fire exclusion has also resulted in increases in shrub cover and the conversion of some prairies to shrublands. Non-native species generally increase after ground-disturbing activities. The dominant native grass, Roemer's Fescue (*Festuca roemeri*), and many herbaceous species are threatened by the uncontrolled spread of Scot's broom (*Cytisus scoparius*). Prescribed fire and other management tools have been used recently in some areas to control Scot's broom and Douglas-fir encroachment, and to attempt to mimic historical conditions.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Altered disturbance regimes	Fire exclusion has resulted in tree and shrub encroachment, loss of habitat diversity	• Fire management • Vegetation management	Integrated habitat restoration using prescribed fire, weed control and seeding with natives
Invasive and other problematic species	Invasive forbs and shrubs are degrading native prairie	• Fire management • Invasive species control	Mechanical and herbicide control of exotics
Roads and development	Habitat has been fragmented and lost to housing and subdivisions	• Environmental review • Land acquisition • Land use planning • Private lands agreements	Acquisition, conservation easements, landowner agreements, and restoration

HERBACEOUS AGRICULTURAL VEGETATION

Overview

Herbaceous Agricultural Vegetation includes both cultivated croplands and pastures and hay. Cultivated croplands can be defined as areas used for the production of annual crops, as well as perennial woody crops such as orchards and vineyards. It includes all lands that are actively tilled. Pastures are defined as areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically as a perennial planting (for example, fields). Conservation Reserve Program fields are cultivated croplands that provide perennial grasslands used by a suite of grassland birds and are an important part of the landscape for Greater Sage-grouse.

CRP fields include both native and non-native vegetation, depending upon the site and species. They are included here because they are agricultural lands, with temporary habitat enhancement. They exhibit a wide range of herbaceous conditions. CRP fields can express habitat conditions of a variety of ecological systems, depending upon what is specifically planted in each field.

Each of these types of habitat can, under certain conditions, support a relatively large number of Species of Greatest Conservation Need (see table below). This may be, in part, due to the high diversity of agricultural lands, including diversity in elevation, highly productive soils, locations in valley bottoms and/or near rivers and streams, and distribution throughout the state. The annual or frequent disturbance associated with agricultural lands makes them valuable seasonally to many wildlife species. Ephemeral or farmed wetlands can be valuable places for overwintering waterfowl, breeding sites for amphibians, and food for many species during certain times of the year. Other features of the agricultural environment, including water developments, buildings and farm structures, roadsides, field borders, fence rows, and windbreaks can provide valuable habitat for wildlife .

Six terrestrial SGCN are considered to have close association with herbaceous agricultural vegetation, five of them (all but Oregon spotted frog) are associated with cultivated cropland. These are the Oregon Spotted Frog, Woodhouse's Toad, Burrowing Owl, Dusky Canada Goose, Greater Sage-grouse, and Gray-tailed Vole. For these species, agricultural lands are considered essential for their continued conservation. A significant number (22) of SGCN are generally associated with cultivated cropland.

For other species with general association, agricultural lands may provide important habitats, by providing important food, for example, and may be as important as habitat found in ecological systems of the natural landscape. Agricultural lands border many rivers and streams, especially in the interior Columbia Basin, and thus are associated with many anadromous and freshwater SGCN fishes. Although a complete analysis has not been done for all SGCN anadromous and freshwater fishes, several appear closely associated with this system, e.g., Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Upper Columbia Spring Chinook Salmon ESU, and likely Bull trout-Mid-Columbia Recovery Unit.

Formation Summary				
Distribution	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
13,354 mi^2	7%	93%	13	55

Cliff, Scree & Rock Vegetation	**Inter-Mountain Basins Cliff and Canyon**	**5**
Cliff, Scree & Rock Vegetation	**North Pacific Alpine and Subalpine Bedrock and Scree**	**1**
Cliff, Scree & Rock Vegetation	**North Pacific Montane Massive Bedrock, Cliff and Talus**	**4**
Cliff, Scree & Rock Vegetation	**Rocky Mountain Alpine Bedrock and Scree**	**1**
Cliff, Scree & Rock Vegetation	**Rocky Mountain Cliff, Canyon and Massive Bedrock**	**2**
Developed & Urban	**Developed, High Intensity**	**1**

Ecological systems found in this formation	Number of SGCN	
	closely associated	generally associated
Cultivated Cropland	5	28
Pasure/Hay	3	29

Major Stressors

- Annual disturbance – timing is key to understanding impacts to wildlife. Changes in disturbance regimes and areas disturbed also may significantly impact wildlife.
- Agricultural chemicals, including pesticides and fertilizers – choice of chemical, timing of exposure, and number of chemicals applied and rate of application are key to understanding impacts to wildlife and fishes.
- Increased predation by various predators, including corvids, gulls, canids, raccoons, opossums, skunks and rodents.

Habitat needs for SGCN associated with this vegetation formation

Reduce pesticide impacts	Reduce pesticide impacts through chemical selection, timing, amount of chemical applied and adoption of integrated pest management strategies.
Enhance fencerows, borders, windbreaks, and roadsides	Selection of appropriate species for planting in these areas, timing of disturbances like mowing to reduce impacts, maintenance of uncultivated and undisturbed strips of vegetation, and protection of these habitats from disturbances such as excessive grazing, vehicle traffic, etc..
Maintain riparian buffer native vegetation	Adequately functioning riparian areas are needed for anadromous and freshwater SGCN fishes

Actions needed to maintain habitat quality for SGCN

- Continue programs that help agricultural lands provide wildlife habitat, principally Natural Resources Conservation Service and Farm Services Agency programs like the Wetland Reserve Program, Conservation Reserve Program, Environmental Quality Incentives Program, and the Resource Conservation and Development Program.
- Identify important connectivity areas in developing landscapes to help jurisdictions plan future growth.

- Continued support for programs that help educate landowners on ways to manage agricultural lands to help benefit wildlife and fishes.
- Support creation of GMA-based Voluntary Stewardship Plans for agricultural areas.

Research and Data Needs

- Understanding how agricultural production affects wildlife at the landscape scale
- Investigating the optimum patch size and landscape context for farmland set-aside programs to benefit grassland and shrub steppe wildlife
- Continued work on benefits of integrated pest management to wildlife,
- Specific habitat enhancements for Species of Greatest Conservation Need.
- Continue biennial updates to the High Resolution Change Detection dataset for the Puget Sound basin; expand the analysis to include ESOCs and Priority Habitats statewide.

Specific Ecological System References (complete list at end of chapter)

Edge, W. D. 2001. Wildlife of Agriculture, Pastures, and Mixed Environs. Pages 342-360 *in* D. H. Johnson, and T. A. O'Neil, editors. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, OR.

Schroeder, M. A. and W. M. Vander Haegen. 2011. Response of greater sage-grouse to the Conservation Reserve Program in Washington State. Studies in Avian Biology 38:517-529.

Vander Haegen, W. M., M. A. Schroeder, W. Y. Chang, and S. M. Knapp. 2015. Avian abundance and reproductive success in the intermountain west: Local-scale response to the conservation reserve program. Wildlife Society Bulletin (In Press).

INTRODUCED AND SEMI-NATURAL

Overview

Introduced and Semi-Natural Vegetation includes 5 systems that are considered human influenced or made: 1) introduced riparian and wetland vegetation and introduced upland vegetation, 2) annual grasslands, 3) perennial grasslands, 4) shrublands, and 5) treed. These are considered spontaneous, self-perpetuating, and not (immediately) the result of planting, cultivation, or human maintenance. Land occupied by introduced vegetation is generally permanently altered (converted) unless restoration efforts are undertaken. Natural vegetation types are usually no longer recognizable. Land cover is significantly altered/disturbed by introduced wetland, grassland, shrubland, and tree species. Examples of these include: reed canary grass invasions in wetland systems, Scot's broom invasions into upland grassland systems, cheatgrass invasions into shrub-steppe systems, and Russian olive along riparian systems in eastern Washington.

Wildlife use of these habitats include, for example, Burrowing Owl use of disturbed vegetation in deep soils along irrigation canals in eastern Washington, Washington Ground Squirrel use of old grazed fields invaded by bulbous bluegrass (*Poa bulbosa*), Streaked Horned Lark use of disturbed vegetation in western Washington airports, and American Badger use of cheatgrass dominated communities of eastern Washington. Six terrestrial SGCN identified as closely associated with this formation are the Streaked Horned Lark, Burrowing Owl, Columbian Sharp-tailed Grouse, Greater Sage-grouse, Valley Silverspot, and the Island Marble, a butterfly that inhabits the San Juan Islands associated with several introduced species that have spread in disturbed habitats, including field mustard (*Brassica campestris*), tall tumble mustard (*Sisymbrium altissimum*), and tall peppergrass (*Lepidium virginicum*). All of these six species are closely associated with introduced perennial grassland, the system with the largest number of closely associated SGCN.

Formation Summary				
Distribution	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
1,085 mi^2	20%	80%	7	37

Ecological systems found in this formation	Number of SGCN	
	closely associated	generally associated
Introduced Riparian and Wetland Vegetation	0	12
Introduced Upland Vegetation – Annual Grassland	2	22
Introduced Upland Vegetation – Perennial Grassland	5	24
Introduced Upland Vegetation –Shrub	1	10
Introduced Upland Vegetation –Treed	0	2

Major Stressors

Human disturbance is the key stressors for these systems, including changes in disturbance patterns and conversion to agricultural production.

Habitat needs for SGCN associated with this vegetation formation

Short-stature exotic grasses and forbs	A number of SGCN that use Introduced and Semi-natural Vegetation are associated with short stature exotic grasses and forbs, essentially providing structural similarities to native habitats. These include Streaked Horned Lark, Burrowing Owl, Oregon Vesper Sparrow, and Columbian Sharp-tailed Grouse. Oregon Spotted Frogs only use reed canary grass habitat to a significant degree when it is mowed annually.
Large unfragmented blocks of habitat	Many SGCN are area sensitive, meaning they have a minimum size threshold for habitat to be functional for uses such as for breeding. Bald Eagle, Peregrine Falcon, Oregon Vesper Sparrow, and Columbian Sharp-tailed Grouse are known to require larger contiguous patches of undeveloped land.

Actions needed to maintain habitat quality for SGCN

- Habitat Management – several SGCN that use Introduced and Semi-natural Vegetation are associated with a particular condition that may be subject to change over time, or a disturbance regime. Streaked Horned Lark, for example, is associated with short-stature vegetation at various airports in south Puget Sound. Airport habitat is actively mowed during the growing season to maintain the short-stature vegetation. Other disturbances like herbicide application, irrigation canal maintenance, and road maintenance have the potential to disrupt, disturb, or eliminate these species.
- Habitat Restoration – restoring native species to these environments can greatly increase their value to wildlife. Adding sagebrush to areas dominated by introduced grasses and forbs can provide a significant benefit to Greater Sage-grouse and Columbian Sharp-tailed Grouse, for example.
- Support creation of GMA-based Voluntary Stewardship Plans for agricultural areas.

OPEN FRESHWATER SYSTEMS

Overview

Open freshwater systems take on a variety of forms, from streams and rivers, potholes and small American Beaver ponds, to large lakes and reservoirs. They are found in every corner of the state, in all climates, at almost all elevations, and are just as common in wilderness areas as they are in major urban centers. Interestingly, Washington has more streams than any state except Alaska. It should be noted that freshwater wetlands and some other standing shallow waters are not classified as Open Water (see Freshwater and Wet Meadow and Marsh).

Open water stands out from all terrestrial and other freshwater systems in that they have significantly greater numbers of closely associated SGCN. That in part is because all freshwater and anadromous fish as well as other aquatic species rely on open water for at least part of their life history. However, a large number of terrestrial and semi-aquatic SGCN also have a close affinity to open waters. These include many amphibians, waterfowl, and invertebrates, as well as species of bats that use open waters to forage on insects. Because open water systems support so many sensitive species, the influence that disturbances pose on SGCN is a serious one to the state's overall biodiversity. In fact, the consequences of numerous disturbances to open water systems are being felt right now. Those are reflected in the large number of aquatic species in Washington that are Federally Threatened and Endangered, such as the 16 Pacific salmon, steelhead and bull trout species units included as SGCN.

Formation Summary				
Distribution*	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
4,402 mi^2	87%	13%	69	20

Cliff, Scree & Rock Vegetation	**Inter-Mountain Basins Cliff and Canyon**	**5**
Cliff, Scree & Rock Vegetation	**North Pacific Alpine and Subalpine Bedrock and Scree**	**1**
Cliff, Scree & Rock Vegetation	**North Pacific Montane Massive Bedrock, Cliff and Talus**	**4**
Cliff, Scree & Rock Vegetation	**Rocky Mountain Alpine Bedrock and Scree**	**1**
Cliff, Scree & Rock Vegetation	**Rocky Mountain Cliff, Canyon and Massive Bedrock**	**2**
Developed & Urban	**Developed, High Intensity**	**1**

Major Stressors

- Reduced glacial and snowpack runoff to replenish open water systems from climate change.
- More frequent and intense droughts lasting longer durations from climate change.
- Physical barriers to instream movement and migration.
- Altered water quality from (e.g., increased temperature, sediment, nutrients, and toxicants) from loss of riparian filtering, as well as urban and agricultural runoff.
- Physical alterations, like dredging, channelizing, damming, and confinement of migrating channels.
- Artificial modifications to hydrology from activities such as damming and irrigation.
- Loss of aquatic habitat complexity.
- Altered natural disturbance processes (e.g., seasonal flooding) and regimes.

Habitat needs for SGCN associated with this formation

Good water quality	Many aquatic and semi-aquatic SGCN require waters that are clean and cold for their survival and fitness. These include many anadromous salmonids, freshwater fishes, amphibians and invertebrates.
Habitat complexity	A large number of SGCN require various types of aquatic habitat and diverse habitat structure. This includes areas with clean spawning gravels, large instream wood, deep pools, off-channel habitats (e.g., oxbows) and locations where species can find cool water refuge during periods of high stream temperatures.
Habitat connectivity	Connectivity is especially important to migratory anadromous fish where their life histories require being able to reach their particular spawning grounds. Lateral connectivity is also important between a stream's main stem and off-channel and floodplain habitats.

Actions needed to maintain habitat quality for SGCN

- Removal of artificial barriers, especially ones that can open up new habitat for SGCN.
- Research to assess influences of climate change and to identify mitigation measures.
- Maintaining functions/processes associated with intact riparian ecosystems.
- Maintenance and enhancements of in-stream structure (e.g., large wood) and complexity.
- Improve water quality (e.g., maintain or decommission roads causing siltation and erosion).
- Reintroduction and protection of American Beaver and conservation of American Beaver ponds.
- Multi-stakeholder groups determine how to manage and monitor riparian areas for multiple socioeconomic benefits.
- Support creation of GMA-based Voluntary Stewardship Plans for agricultural areas.
- Continue biennial updates to the High Resolution Change Detection dataset for the Puget Sound basin; expand the analysis to include ESOCs and Priority Habitats statewide.
- Provide feedback to local jurisdictions about the effectiveness of their land use regulations and incentives to conserve ESOCs and Priority Habitats.

RECENTLY DISTURBED OR MODIFIED

Overview

There are seven Recently Disturbed or Modified ecological systems in Washington. They can be generally categorized as 1) previously harvested (primarily commercial logging) and 2) recently burned. Either of these two groups can includes places where the disturbance is the result of something other than human intervention, such as a stand of windblown timber. But in many cases the disturbance is human-caused (e.g., a catastrophic wildfire caused by a built-up fuels from fire suppression). In general, these areas are altered from their historical condition, especially when the disturbance is directly caused by humans. Consequently they have lower ecological integrity when compared to their undisturbed counterparts and their value to native species has usually been reduced.

Although these lands may be less valuable, it is important not to undervalue or ignore them. One reason for this is that they comprise a large area, 10 percent of the state's land area in total. Because of this they are prominent across Washington's landscape, and thus the possibility of improving their suitability as SGCN habitat must be addressed This includes their potential for habitat restoration as well as their potential to provide other benefits (e.g., as connections between important habitat areas

Many recently disturbed or modified areas provide habitat to SGCN. In fact, 74 SGCN are associated with these systems, many of which are habitat generalists, though some have a particular affinity to the disturbed nature of these systems. Eleven SGCN are closely associated with these modified systems. The systems with the largest number of closely associated species are the coniferous regeneration systems, especially the grass/forb and shrub stages. Four of the closely associated SGCN with the grass/forb stages are butterflies, where logging creates or re-creates suitable habitat in certain situations through the establishment of small meadows. Other species like Mountain Quail and Peregrine Falcon are closely associated with these stages.

Formation Summary				
Distribution	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
6,649 mi^2	38%	62%	11	63

Ecological systems found in this formation	**Number of SGCN**	
	closely associated	**generally associated**
Disturbed non-specific	1	8
Harvested Forest – Grass/Forb Regeneration	5	15
Harvested Forest – Northwestern Conifer Regeneration	6	22
Harvested Forest – Shrub Regeneration	5	13
Recently Burned Forest	2	17
Recently Burned Grassland	3	21
Recently Burned Shrubland	2	14

Major Stressors

- Altered natural disturbance regimes and processes.
- Loss of structural diversity and habitat complexity.
- Loss of older forests because of short harvest rotation cycles.
- Spread of invasive plants.
- Habitat fragmentation and loss of connectivity.

Habitat needs for SGCN associated with this formation

Complex habitat structure	Many SGCN associated with disturbed habitats prefer the presence of more complex habitat feature such as snags and downed wood, and multiple canopy layers. The SGCN that have an affinity for more complex conditions are Barrow's Goldeneye, Great Gray Owl, Lewis' Woodpecker, Northern Spotted Owl, Western Bluebird, Keen's Myotis, and Silver-haired Bat.
Protect key habitats within area of disturbance	Within disturbed areas some types of habitats deserve special attention because of their value to many SGCN. These include systems such wetlands and riparian areas.
Climax condition	Several species prefer more mature habitat conditions or habitats that have at least some characteristics of climax conditions, like large trees. The SGCN that have an affinity for these conditions are Cascade Torrent Salamander, Bald Eagle, Barrow's Goldeneye, Great Gray Owl, Northern Spotted Owl, Keen's Myotis, and Western Gray Squirrel.
Open habitat	Some SGCN prefer open habitat over those with closed understories. These are Loggerhead Shrike, Short-eared Owl, Streaked Horned Lark, White-headed Woodpecker, and American Badger.

Actions needed to maintain habitat quality for SGCN

- Controlling the spread and removal of invasive plants.
- Controlled burns and forest thinning to reduce the possibility of large wildfire.
- Habitat restoration.
- Prioritization of disturbed and modified sites and landscapes for conservation and protection.

SALT MARSH VEGETATION

Overview

Salt Marsh vegetation includes three ecological systems; Inter-Mountain Basins Alkaline Closed Depression, Inter-Mountain Basins Greasewood Flat, Inter-Mountain Basins Playa, and Temperate Pacific Tidal Salt/Brackish Marsh. The Alkaline Closed Depression ecological systems are sparsely to densely vegetated found on seasonally flooded sites over saline soils in closed depressions or terminal basins. The Greasewood Flat ecological system includes open to moderately dense shrublands dominated or co-dominated by Greasewood (*Sarcobatus vermiculatus*) and also with saline soils. Inter-Mountain Basins Playa and Alkaline Closed Depression and Inter-Mountain Basins Greasewood Flat ecological systems are found in central to southern eastern Washington. The Tidal/Brackish Marsh ecological system is associated with tidally influenced coastal wetlands of estuaries, lagoons, and bays, and behind sand spits. All four of these ecological systems are ecological systems of concern.

Climate changes that lead to changes in water levels may impact inter-mountain basins playa, alkaline closed depressions and greasewood flats. Changes in precipitation may lead to fluctuations in salinity levels, which could lead to shifts in vegetation composition. Increases in runoff that increase nutrient levels in basin playas and alkaline closed depressions could also threaten vegetation. Projected sea level rise represents a key climate stressor for tidal salt and brackish marshes, as it could lead to submergence of habitats and declines in vegetation unless they are able to migrate inwards through sediment accretion.

Formation Summary				
Distribution*	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
91 mi^2	61%	39%	5	28

*This Vegetation Formation is typically a narrow linear feature or small patch; such shapes are not well-suited for detection by the methods used for this project; the actual extent of this Formation is likely broader than reported.

Ecological systems found in this formation	Number of SGCN	
	closely associated	generally associated
Inter Mountain Basins Alkaline Closed Depression	2	13
Inter Mountain Basins Greasewood Flat	2	9
Inter Mountain Basins Playa	3	7
Temperate Pacific Tidal Salt and Brackish Marsh	1	18

☐ Ecological System of Concern

Major Stressors

Habitat degradation and exotic plant invasions, development (dredging, filling, channeling), hydrological alteration and climate change.

Habitat needs for SGCN associated with this vegetation formation

High invertebrate diversity/abundance	Invertebrates serve as food for many of these species, including Marbled Godwit, Harlequin Duck, Red-necked Grebe

Actions needed to maintain habitat quality for SGCN

- Fire management (establishment of natural fire regimes and prescribed fire)
- Grazing, Agriculture, and farm management
- Invasive species control
- Habitat restoration, research, and native species restoration, including hydrological restoration

Ecological systems discussed in greater detail in this section

Of the 12 ecological systems found in this formation, the following 3 are discussed in greater detail here. These are considered ecological systems of concern, either because of their imperiled conservation status, because of their importance to SGCN, or both.

A. Inter-Mountain basins Greasewood Flat
B. Inter-Mountain Basins Playa and Alkaline Closed Depression
C. Temperate Pacific Tidal Salt/Brackish Marsh

Inter-Mountain Basins Greasewood Flat (ESOC)

Conservation Status and Concern

This is a geographically limited ecological system with small sites. The primary conservation concern is degradation of the system.

Description and Distribution

Greasewood flats are limited to the Columbia Basin, especially the northern and central portions of the basin. They often co-occur with playas and alkaline depressions. They are more common in Benton, Grant, Franklin, Klickitat, and Walla Walla counties.

Soils are typically saline and bare ground is a common feature. The water table remains high enough to maintain vegetation, despite salt accumulations. Wetland vegetation may concentrate near seeps/springs or in drainages where standing water is perennial. Saline soils and dominance by greasewood distinguish this type from other ecological systems. The primary ecological process maintaining greasewood flat systems is an elevated groundwater table.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
None	S1	Critically imperiled/ declining Decline of 30-50% within the last 50 years and from historical conditions	**MAMMALS:** American Badger, Black-tailed Jackrabbit, Hoary Bat, Silver-haired Bat, Spotted Bat,
			BIRDS: Burrowing Owl*, Golden Eagle, Greater Sage-grouse*, Loggerhead Shrike, Peregrine Falcon, Short-eared Owl

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

The primary stressors are alteration of hydrology, livestock practices, annual exotic species invasion, fire regime alteration, and fragmentation. Activities resulting in hydrological alterations, sedimentation, nutrient inputs, and/or physical disturbance may negatively shift species composition and allow for non-native species establishment. Declining water tables create perennially dry soils, stop surface salt accumulation, and allow salts to leach deeper that create a drier, less saline soil resulting in a change in

vegetation composition and pattern. The tall perennial Pepperwood (*Lepidium latifolium*), a non-native invasive species decreases the abundance of shorter native grasses and forbs. The introduction of cheatgrass into these communities has altered fuel loads and fuel distribution. Fire alters the community composition because salt-desert shrubs are not adapted to periodic fire.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Alteration of hydrology	Hydrological alterations, agriculture, roads, and development	• Land acquisition • Private lands agreements	Identify and protect sites with good ecological integrity.
Invasive and other problematic species	Invasive species increase with excessive grazing, trampling	• Grazing/farm management • Invasive species control • Land use planning	Mechanical and herbicide control of exotics, planning Support creation of GMA-based Voluntary Stewardship Plans

Inter-Mountain Basins Playa and Alkaline Closed Depression (ESOC)

Conservation Status and Concern

A significant amount of this system has been lost due to alterations of hydrology. Degradation has occurred across its range and in most locations. There are three SGCN that are considered closely associated with this ecological system and 12 that are considered generally associated with this ecological system (see table below).

Description and Distribution

The Inter-Mountain Basins Playa and the Inter-Mountain Basins Alkali Closed Depression ecological systems occur throughout much of the cool arid and semi-arid regions of the Columbia Plateau and Great Basin. They almost always appear within a shrub steppe or semi-desert landscape. They are differentiated by 1) vegetation cover (playa is typically sparse to patchily vegetated, generally less than 10 percent plant cover while alkali closed depression is moderately to densely covered by herbaceous plants), 2) soil chemistry (playas are considered more saline than alkaline closed depressions), and 3) hydrological regime (playas are more intermittently flooded; closed depressions are more seasonally to semi-permanently flooded).

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes Freshwater Wetlands	S1	Critically Imperiled/ declining Declines of 30-50% within the last 50 years and from historical conditions	**MAMMALS:** Hoary Bat, Kincaid Meadow Vole, Silver-haired Bat, Spotted Bat, Townsends Big-eared Bat
			BIRDS: American White Pelican, Bald Eagle, Barrow's Goldeneye, Cinnamon Teal*, Golden Eagle, Greater Sage-grouse*, Loggerhead Shrike, Marbled Godwit, Peregrine Falcon*, Short-eared Owl

* SGCN is closely associated with this ecological system

Key Stressors and Actions Needed

Historical and current land use practices have impacted hydrologic, geomorphic, and biotic structure and function of playas on the Columbia Basin. Reservoirs, water diversions, ditches, roads, and human land uses in the contributing watershed can also have a substantial impact on the hydrological regime. Direct alteration of hydrology (i.e., channeling, draining, damming) or indirect alteration (i.e., roads or removing vegetation on adjacent slopes) results in changes in the amount and pattern of herbaceous wetland habitat. Excessive livestock grazing leads to a shift in plant species composition.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Alteration of hydrology	Hydrological alterations associated with agriculture, roads, and development	• Land acquisition • Private lands agreements • Water management	Identify and protect sites with good ecological integrity.
Invasive and other problematic species	Invasive species increase with excessive grazing, trampling	• Grazing/farm management • Invasive species control	Mechanical and herbicide control of exotics, planning
Agriculture and aquaculture side effects	Conversion to agriculture eliminates and degrades habitat	• Land use planning • Grazing/farm management	Support creation of GMA-based Voluntary Stewardship Plans

Temperate Pacific Tidal Salt and Brackish Marsh (ESOC)

Conservation Status and Concern

A significant amount of this system has been lost. Habitat degradation has occurred across its range and in most locations. There is one terrestrial SGCN that is considered closely associated with this ecological system, and 18 terrestrial species considered generally associated with this ecological system. A complete analysis of habitat association has not been done for SGCN fishes.

Description and Distribution

Temperate Pacific Tidal Salt and Brackish Marsh ecological systems are found along the Pacific Coast, from south-central Alaska to the central California coast. In Washington, it occurs in large bays on the outer coast and around the waters of Puget Sound. Occurrences are confined primarily to inter-tidal portions of estuaries, coastal lagoons and bays, and behind sand spits or other locations protected from wave action. Their associated specific environments are defined by ranges of salinity, tidal inundation regime, and soil texture. This system is characterized as being dominated by emergent vegetation whose composition is influence by tidal fluctuations and varying degree of salinity (saline to brackish). Marine salt water circulation through a marsh is most important factor in marsh plant species distribution.

Characteristic plant species include seashore salt grass (*Distichlis spicata*), sea milkwort (*Glaux maritima*), jaumea (*Jaumea carnosa*), pickleweed (*Salicornia* spp.), sea blight (*Suaeda* spp.), and arrow grass (*Triglochin* spp.).

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes Nearshore – coastal Nearshore – Puget Sound	S2	Imperiled/ declining Declines of 50-70% within the last 50 years and from historical conditions	**MAMMALS:** Shaw Island Vole
			BIRDS: Bald Eagle, Barrow's Goldeneye, , Brown Pelican, Common Loon, Dusky Canada Goose, Harlequin Duck, Marbled Godwit, Peregrine Falcon, Purple Martin, Red-necked Grebe, Western High Arctic Brant
			FISH: To be determined- research needed
			INVERTEBRATES: Island Marble*, Oregon Silverspot, Taylor's Checkerspot, Valley Silverspot

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

A number of stressors related to development, transportation and agriculture contribute threats to this ecological system.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Alteration of hydrology	Hydrological alterations, agriculture, roads, and development	• Planting/seeding • Vegetation management • Water management • Land use planning	Salt marsh restoration, including restoration of native species Monitor and improve implementation of land use regulations (e.g., Shoreline Management Act)
Invasive and other problematic species	Invasive species such as Spartina	• Invasive species control	Mechanical and herbicide control of exotics

SCRUB AND HERBACEOUS COASTAL VEGETATION

Overview

Scrub and herbaceous coastal vegetation includes two ecological systems, North Pacific Coastal Cliff and Bluff, and North Pacific Maritime Coastal Sand Dune and Strand. The North Pacific Coastal Cliff and Bluff includes un-vegetated or sparsely vegetated rock cliffs and very steep bluffs along Washington's coastline and associated marine and estuarine inlets. Sand dunes are isolated and scattered in Puget Sound, and most abundant along the southern Washington coastline.

Of the two ecological systems, North Pacific Maritime Coastal Sand Dune and Strand has the larger number of closely associated SGCN, and is discussed in greater detail below. Species that are closely associated with the North Pacific Coastal Cliff and Bluff ecological system include the Stellar Sea Lion, Peregrine Falcon, Rock Sandpiper, Island Marble, and Taylor's Checkerspot.

Formation Summary				
Distribution	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
28 mi^2	49%	51%	11	4

Ecological systems found in this formation	**Number of SGCN**	
	closely associated	**generally associated**
North Pacific Coastal Cliff and Bluff	5	3
North Pacific Maritime Coastal Sand Dune and Strand	8	3

Ecological System of Concern

Major Stressors

1. Invasive species
2. Habitat degradation
3. Recreation
4. Climate Change

Currently, the major threats to Scrub and Herbaceous Coastal Vegetation is the continued spread and subsequent stabilization of sand dunes by invasive species, off road vehicle use, road construction, intentional dune stabilization, and conversion to residential lots. The exotic European beachgrass (*Ammophila arenaria*) has been extensively planted for stabilization purposes and has also spread widely on its own for over 125 years and the eastern North American native American beachgrass (*A. breviligulata*) has been planted and spreading on the Long Beach peninsula. Once these plant species became established, the physical form and natural processes of dunes were altered, leading to rapid acceleration of successional processes, which then altered the native species composition.

Sea level rise, increased coastal erosion, and increased storminess and wave action represent significant climate stressors for this formation. Projected sea level rise could cause erosion and/or landward shift of dunes and cliffs. Similarly, greater wave and wind action from storms could cause increased disturbance and erosion of cliffs, dunes, and dune vegetation. Climate induced-changes or declines in dune vegetation

that help stabilize and protect dunes could make dune habitat more vulnerable to disturbances from increased erosion, waves, and winds.

Habitat needs for SGCN associated with coastal sand dune and strand

High ecological integrity	Some of the birds (Streaked Horned Lark, Western Snowy Plover) and invertebrates (Taylor's Checkerspot, Sand Verbena Moth, Oregon Silverspot, Acmon Blue) require either an open dune composition without exotic beachgrasses, or short-stature vegetation provided by native species, and are sensitive to invasive weeds including dunegrasses.

Actions needed to maintain habitat quality for SGCN

- Habitat restoration, research, and native species restoration**.**
- Invasive species control,
- Manage public recreation, including off road vehicle use.

Ecological systems discussed in greater detail in this section

Of the two ecological systems found in this formation, North Pacific Coastal Sand Dune and Strand is discussed in greater detail here. It is considered an ecological system of concern because of its imperiled conservation status and because of its importance to SGCN.

North Pacific Maritime Coastal Sand Dune and Strand (ESOC)

Conservation Status and Concern

This ecological system is located in active or stabilized dunes along the coast. Exotic species like American beachgrass have greatly reduced or eliminated active dune processes, helping to accelerate successional process, greatly increasing vegetative cover, and restricting habitat for species associated with this ecological system. There are 11 Species of Greatest Conservation Need in this ecological system; eight of those are closely associated.

Description and Distribution

Sand dunes are distributed along the Pacific coast from south-central Alaska to central Oregon. In Washington dunes are found locally in Puget Sound, coastlines along the Straits of Juan de Fuca, and the western Olympic Peninsula. The most extensive areas of sand dunes are in the southern portion of the Washington coast between the mouths of the Copalis and Columbia Rivers. Coastal dunes include beach strand (not the beach itself but sparsely or densely vegetated areas behind the beach), foredunes, sand spits, and active to stable backdunes and sandsheets. Coastal dunes often front portions of inlets and tidal marshes. Significant plant species include native grasses such as dunegrass (*Leymus mollis*) and red fescue (*Festuca rubra*).

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes Nearshore – coastal Nearshore – Open Water Nearshore – Puget Sound	S1	Imperiled/ declining Decline of 50-70% within the last 50 years Decline of 70-80% from historical conditions	**MAMMALS:** Shaw Island Vole **BIRDS:** Streaked Horned Lark*, Western Snowy Plover*, Bald Eagle, Peregrine Falcon **INVERTEBRATES:** Sand Verbena Moth*, Oregon Silverspot*, Taylor's Checkerspot*, Acmon Blue*, Island Marble*, Siuslaw Sand Tiger Beetle*

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Fish and wildlife habitat loss or degradation	Dune stabilization has resulted in accelerated succession, invasion of exotic trees, shrubs and grasses, and reduction or loss of function of critical habitat	• Vegetation management • Land use planning	Integrated habitat restoration using weed control and seeding with natives Monitor and improve implementation of land use regulations (e.g., Shoreline Management Act), enhance incentives to encourage conservation measures.
Invasive and other problematic species	Invasive forbs and shrubs are degrading native vegetation	• Invasive species control	Mechanical and herbicide control of exotics
Recreation	Off-road vehicle use has resulted in the loss of native communities	• Land acquisition • Private lands agreements	Identification and protection of areas with high ecological integrity

SEMI-DESERT SCRUB AND GRASSLAND

Overview

Semi-Desert Scrub and Grasslands includes 10 verified ecological systems in Washington. Comprised of native upland vegetation, these systems occur throughout most of eastern Washington. The underlying soils are variable across the spectrum, although some systems are strongly linked to a particular soil characteristic (e.g., deep soil systems). All Semi-Desert Scrub and Grassland systems in Washington have an understory layer typically made up of native bunchgrasses that are almost always accompanied by other perennial grasses and/or forbs. Although not all the systems have a shrub layer, most have some cover of shrubs. Dominant shrubs include big sagebrush (*Artemisia tridentata*), antelope bitterbrush (*Purshia tridentata*), rabbitbrush (*Chrysothamnus* spp.), and dwarf sagebrush (*Artemesia arbuscula*). At the soil surface, diverse communities of moss and lichen can also be found, especially if soils are relatively intact or undisturbed.

The ecological systems with the most closely associated SGCN include the Inter-Mountain Basin Big Sagebrush Shrubland and Steppe, each with fifteen closely associated SGCN. Columbia Plateau Steppe and Grassland is next with nine closely associated SGCN, followed by Columbia Plateau Scabland Shrubland, with six closely associated SGCN. Four ecological systems are Ecological Systems of Concern, and are discussed in more detail below. SGCN closely associated with the Columbia Plateau Scabland Shrubland include Sage Grouse, Sharp-tailed Grouse, Sage Thrasher, Ferruginous Hawk, Short-horned Lizard, and Striped Whipsnake.

Formation Summary				
Distribution	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
7,729 mi^2	46%	54%	22	38

Ecological systems found in this formation	Number of SGCN	
	closely associated	generally associated
Columbia Plateau Low Sagebrush Steppe	2	14
Columbia Plateau Scabland Shrubland	6	19
Columbia Plateau Steppe and Grassland	9	23
Inter Mountain Basins Big Sagebrush Shrubland	15	22
Inter Mountain Basins Big Sagebrush Steppe	15	26
Inter Mountain Basins Mixed Salt Desert Scrub	3	14
Inter Mountain Basins Montane Sagebrush Steppe	2	12
Inter Mountain Basins Semi-Desert Grasslands	2	16
Inter Mountain Basins Semi-Desert Shrub Steppe	3	8

☐ Ecological System of Concern

Major Stressors

- Agriculture conversion
- Wind power and residential development
- Soil disturbance
- Invasive annual plants.
- Fire and fire frequency
- Excessive grazing
- Roads and transmission lines

Climate changes including shifts in precipitation, drought, and altered fire regimes may affect plant composition, density, and distribution in semi-desert scrub and grassland habitats. Precipitation likely influences plant composition, growth, and recruitment, and drought negatively affects seedling survival in sagebrush systems, reduces shrub cover, and elevates herbaceous diversity and cover. Increasing fire frequencies and/or intensities will likely negatively affect sagebrush and shrub habitats, and may favor grassland expansion. However, fire also favors cheatgrass and other non-native annual establishment, which can alter ecosystem function.

Habitat needs for SGCN associated with this vegetation formation

Deep Soils	Several species: American Badger, Pygmy Rabbit, Washington Ground Squirrel, and Burrowing Owl require relatively deep soils suitable for burrowing. The burrowing actions of some of these species also function to provide natural disturbance in grassland habitats.
Minimal habitat fragmentation	Greater Sage-grouse, Sage Thrasher, and Sagebrush Sparrow require large intact blocks of shrub-steppe habitat.
High ecological integrity	Many SGCN that use ecological systems associated with Semi-Desert Scrub and Grassland do best where native perennial plants such as bunchgrasses are dominant and where the fire return interval is low. Some SGCN also have highly specific preferences in terms of habitat structure. Ecological integrity of this habitat's riparian areas is important for SGCN interior Columbia Basin anadromous salmonids and freshwater fishes.

Actions needed to maintain habitat quality for SGCN

- Management to maintain infrequent intervals of fire
- Grazing management
- Invasive species control (cheatgrass in particular)
- Habitat and native species restoration

Research and Data Needs

- Research to help improve techniques for restoring degraded habitat.
- Studies to help develop science-based compensatory mitigation ratios.
- Expand the High Resolution Change Detection analysis to include ESOCs and Priority Habitats statewide.

Ecological systems and other habitats discussed in greater detail in this section

A. Columbia Plateau Low Sagebrush Steppe
B. Inter-Mountain Basins Big Sagebrush Steppe
C. Inter-Mountain Basins Semi-Desert Shrub Steppe
D. Columbia Plateau Steppe and Grassland

Columbia Plateau Low Sagebrush Steppe (ESOC)

Conservation Status and Concern

This ecological system is very rare, occupying less than one percent of Washington's land area. The ecological integrity of the system is in decline, primarily due to disturbances from intense grazing and invasive plants. Sixteen terrestrial SGCN are associated with this system and two of those are closely associated.

Description and Distribution

This large patch system occurs on isolated ridges at or above the lower treeline (approximately 3300 to 4500 feet) within the East Cascade, Blue Mountain, and Columbia Plateau Ecoregions. The system often lies adjacent to Douglas-fir and ponderosa pine forests. While the overstory canopy is dominated by dwarf sagebrush understory vegetation is made up of bunchgrasses and/or native forbs. Although bunchgrasses typically dominate, forbs can be dominant, especially at higher elevations. The space between vascular plants may support a crust of mosses and lichens, especially where soils are relatively undisturbed and intact. Substrates are shallow, fine-textured soils or poorly drained clays, and are almost always very stony.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes Shrub-steppe	S2	Imperiled/ declining >30% decline within the last 50 years. Decline from historical conditions is unknown.	**MAMMALS:** American Badger, Black-tailed Jackrabbit, Hoary Bat, Merriam's Shrew, Silver-haired Bat, Spotted Bat, Townsend's Big-eared Bat, White-tailed Jackrabbit
			BIRDS: Burrowing Owl, Golden Eagle, Greater Sage-grouse*, Loggerhead Shrike, Mountain Quail, Short-eared Owl
			REPTILES: Pygmy Short-horned Lizard*
			FISH: To be determined- research needed
			INVERTEBRATES: Morrison's Bumblebee

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Disturbance from grazing and from the spread of invasive plants seem to be the chief threats to this system. On some sites cheatgrass has replaced native perennials. This is especially true on sites that are intensely grazed. Intense grazing also reduces the cover of moss and lichens and increases patches of bare ground. Areas of bare ground are highly susceptible to cheatgrass invasion.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Invasive and other problematic species	Invasive annual grasses (cheatgrass) and exotic weeds have degraded habitat. In other places the problem is an overabundant cover of native shrubs.	• Invasive species control	Mechanical and herbicide control of invasive species.
Fish and wildlife habitat loss or degradation	Habitat has been lost to agriculture, and development to a lesser degree.	• Environmental Review • Land acquisition • Land use planning • Private lands agreements	Acquisitions, conservation easements, landowner agreements, and restoration. Support creation of GMA-based Voluntary Stewardship Plans

Columbia Plateau Steppe and Grassland (ESOC)

Conservation Status and Concern

Historically this system was more expansive across eastern Washington. Much of that expanse has been converted, especially to croplands. What is left is mostly degraded by grazing, an altered fire regime, invasive plants, and various other disturbances. Thirty-two terrestrial SGCN are associated with this system and nine of those are closely associated.

Description and Distribution

This extensive grassland system is dominated by perennial bunchgrasses and forbs (greater than 25 percent cover) and sometimes a sparse canopy of shrubs (less than 10 percent cover). Soils are variable, ranging from relatively deep to stony volcanic-derived clays, to alluvial sands. A characteristic of the soils is that often they lack areas of exposed or bare soil. Instead they typically are carpeted by a crust of mosses and lichens, especially where soils are intact and relatively undisturbed. In contrast to closely related ecological systems, historical fire frequency is higher, which is a factor for its low cover of fire intolerant shrubs. In Washington this large patch system is widespread throughout the Columbia Plateau Ecoregion, though it also occurs in small segments of the Blue Mountain, Okanogan, and East Cascade Ecoregions.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Eastside Steppe	S2	Imperiled/ declining	**MAMMALS:** American Badger*, Black-tailed Jackrabbit, Hoary Bat, Merriam's Shrew, Silver-haired Bat, Spotted Bat, Townsend's Big-eared Bat, Townsend's Ground Squirrel, Washington Ground Squirrel, White-tailed Jackrabbit
			BIRDS: Burrowing Owl, Cinnamon Teal, Ferruginous Hawk*, Golden Eagle, Greater Sage-grouse*, Loggerhead Shrike, Mountain Quail, Sage Thrasher*, Sagebrush Sparrow, Columbian Sharp-tailed Grouse*, Short-eared Owl

			REPTILES/AMPHIBIANS: Columbia Spotted Frog, Northern Leopard Frog*, Tiger Salamander, Woodhouse's Toad*, Desert Nightsnake, Ring-necked Snake*, Pygmy Short-horned Lizard*, Side-blotched Lizard
			FISH: To be determined- research needed
			INVERTEBRATES: Morrison's Bumblebee, Hoder's Mountainsnail, Ranne's Mountainsnail

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

The ecological integrity of this system has been diminished by persistent grazing, cropland conversion, invasive plants, altered fire regime, soil disturbance, and habitat fragmentation. Most deep soils steppe and grasslands has been converted to croplands. Thus most of what remains is on shallow, rocky soils. Although cropland conversion rates are not nearly what they were at their peak, conversions to agriculture still take place, especially in the wine-producing southern Columbia Valley. Residential and wind farm development is another source of direct loss of this habitat. And much of what has not already been converted is degraded. Fire suppression throughout much of the range has degraded the system by increasing shrub cover. These shrubs have displaced bunchgrasses and forbs by outcompeting with them for space and light. Grazing practices incompatible with habitat conservation have also degraded a considerable amount of this habitat. Where grazing is heavy and persistent the system responds in various ways depending on the type of grazing and season. In general, overgrazing has spread invasive plants, decreased native perennial cover, compacted soils, eliminated soil crusts of mosses and lichens, and has increased shrub cover. Across much of this landscape grazing and other land uses have increased bare ground and have replaced native perennials with cheatgrass. Fire on livestock-altered vegetation has further promoted the spread of annuals.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Altered disturbance regimes	An altered fire regime and ground disturbance has degraded the habitat and has led to a loss of habitat diversity. Fire has a particularly strong impact to indigenous shrub and bunchgrass communities.	• Fire management • Vegetation management • Grazing/farm management • Invasive species control	Integrated habitat restoration using prescribed fire, weed control, and seeding with native vegetation.
Fish and wildlife habitat loss or degradation	Habitat has been lost to agriculture and the development of homes and wind farms.	• Environmental Review • Land acquisition • Land use planning • Private lands agreements	Acquisitions, conservation easements, landowner agreements, and restoration. Support creation of GMA-based Voluntary Stewardship Plans

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Invasive and other problematic species	Invasive annual grasses (cheatgrass) and exotic weeds have degraded habitat.	• Invasive species control	Mechanical and herbicide control of invasive species.

Inter-Mountain Basins Big Sagebrush Steppe (ESOC)

Conservation Status and Concern

Historically this system was more expansive across eastern Washington. Much of that expanse has been converted, especially to croplands. What is left is mostly degraded by grazing, an altered fire regime, invasive plants, and various other disturbances. Forty-one terrestrial SGCN are associated with this system and 15 of those are closely associated.

Description and Distribution

This large patch system occurs throughout a large portion of the Columbia Plateau and Okanogan Ecoregions, as well as the lower foothills of the East Cascade Ecoregion. When found in less disturbed conditions it takes the character of a grassland with a conspicuous, but discontinuous, layer of shrubs. The natural fire regime of this ecological system historically maintained this patchy distribution of shrubs. The characteristic shrubs, typically sagebrush (*Artemisia* spp.) and/or antelope bitterbrush, form an open to moderately dense shrub layer (5 to 40 percent cover). Ground cover typically is made up of moderate to dense layer (more than 25 percent cover) of perennial bunchgrasses, although native forbs are also common to the herbaceous layer of this system. Soils are typically deep and non-saline, and typically are encrusted on the surface by mosses and lichens that bind the soil surface (biological soil crust),especially when soils are undisturbed. This system differs from the similar Inter-Mountain Basins Montane Sagebrush Steppe in that it occurs at lower elevations, mainly below 3000 feet.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Shrub-steppe	S2	Imperiled/ declining Decline of 30-50% within the last 50 years and from historical conditions	**MAMMALS:** American Badger*, Black-tailed Jackrabbit, Hoary Bat, Merriam's Shrew, Pygmy Rabbit*, Silver-haired Bat, Spotted Bat, Townsend's Big-eared Bat, Townsend's Ground Squirrel, Washington Ground Squirrel, White-tailed Jackrabbit
			BIRDS: Burrowing Owl*, Cinnamon Teal, Ferruginous Hawk*, Golden Eagle, Greater Sage-Grouse*, Loggerhead Shrike, Mountain Quail, Peregrine Falcon, Sage Thrasher*, Sagebrush Sparrow*, Columbian Sharp-tailed Grouse*, Short-eared Owl
			REPTILES/AMPHIBIANS: Northern Leopard Frog*, Tiger Salamander, Western Toad, Woodhouse's Toad*, Desert Nightsnake, Ring-necked Snake*, Sagebrush Lizard*, Sharptail Snake*, Pygmy Short-horned Lizard*, Side-Blotched Lizard, Striped Whipsnake*
			FISH: To be determined- research needed

			INVERTEBRATES: Morrison's Bumblebee, Columbia Oregonian, Poplar Oregonian, Hoder's Mountainsnail, Ranne's Mountainsnail, Limestone Point Mountainsnail, a mayfly species (*Paraleptophlebia falcula*)

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Because this system lies on deep, fertile soils, it has been targeted for its suitability as cropland. Consequently, much of this system has been converted to crops, especially in the Columbia Basin Reclamation area. Cropland conversions have made deep soil Big Sagebrush Steppe rare. Although rates of cropland conversion are not nearly what they were at their peak, agriculture conversions still occur like in the wine-producing southern Columbia Valley. Residential and wind farm development is another source of direct loss of this habitat. Grazing is another ongoing disturbance, especially when grazing practices are incompatible with habitat conservation. Where grazing is heavy and persistent the system responds in various ways depending on the type of grazing and season. In general, overgrazing spreads invasive plants, compacts soils, eliminates important soil crusts of mosses and lichens, and can lead to a dense shrub cover. Dense shrub cover can in turn compete with native bunchgrasses for very limited water, reducing their cover. Shrubs also increase following fire suppression. Frequent intense fires, on the other hand, can eliminate entire stands of sagebrush. Recovery to pre-fire shrub cover can then take decades, especially in low rainfall areas.. After wildfire, conditions become favorable for the spread of annuals, such as cheatgrass, which make sites more susceptible to subsequent wildfire. All these changes in shrub-steppe composition and structure ultimately reduce the habitat conditions required for many SGCN to persist.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Altered disturbance regimes	Fire and ground disturbance has degraded the habitat and has led to a loss of habitat diversity. Fire has a particularly strong impact to indigenous shrub and bunchgrass communities.	• Fire management • Vegetation management • Grazing /farm management	Integrated habitat restoration using prescribed fire, weed control, and seeding with native vegetation.
Fish and wildlife habitat loss or degradation	Habitat has been lost to agriculture and the development of homes and wind farms.	• Environmental Review • Land acquisition • Land use planning • Private lands agreements	Acquisitions, conservation easements, landowner agreements, and restoration. Support creation of GMA-based Voluntary Stewardship Plans.
Invasive and other problematic species	Invasive annual grasses (cheatgrass) have degraded habitat – other problems include an overabundant cover of native shrubs.	• Invasive species control	Mechanical and herbicide control of invasive species.

Inter-Mountain Basins Semi-Desert Shrub Steppe (ESOC)

Conservation Status and Concern

This is the rarest of all Semi-Desert Scrub and Grassland ecological systems in Washington, occupying roughly a tenth of one percent of Washington's land area. Being in the driest region of Washington, this shrub-steppe ecosystem is particularly vulnerable to the spread of invasive plants that often are facilitated by fire and grazing. Eleven terrestrial SGCN are associated with this system, and three bird species are closely associated: Burrowing Owl, Ferruginous Hawk, and Greater Sage-grouse.

Description and Distribution

Inter-Mountain Basins Semi-Desert Shrub Steppe occurs in the hottest and driest parts of southeastern Washington's Columbia Plateau, where annual rainfall is less than 8 inches. Although some occurrences are on public lands, most is in private ownership. Patch sizes of this ecological system range from small to large. Though the canopy often consists of an open to moderately dense mix of shrubs and dwarf shrubs, some occurrences are dominated by a single species of shrub. Dominant shrubs include spiny hopsage (*Grayia spinosa*), winterfat (*Krascheninnikovia lanata*), and rubber rabbitbrush (*Ericameria nauseosa*). Native herbaceous cover in the understory typically exceeds 25 percent and principally is made up of bunchgrasses with few or no forbs. The natural fire regime is important to maintaining a patchy distribution of shrubs, which is a characteristic of this system. The result is that the general look tends to resemble grassland rather than shrubland.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Shrub-steppe	S1	Imperiled/ declining 50-70% decline within the last 50 years and from historical conditions	**MAMMALS:** Pygmy Rabbit, Townsend's Big-eared Bat, Washington Ground Squirrel
			BIRDS: Burrowing Owl*, Ferruginous Hawk*, Golden Eagle, Greater Sage-grouse*, Loggerhead Shrike, Short-eared Owl, Cinnamon Teal
			FISH: To be determined- research needed
			INVERTEBRATES: Morrison's Bumble Bee

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

This system's ecological integrity has been altered by persistent grazing, invasive plants, wildfire, soil disturbances, and habitat fragmentation. Grazing practices incompatible with habitat conservation have stressed the system by disturbing the delicate soils and by exposing bare ground. It also disturbs the layer of moss and lichens that lock in scarce amounts of soil moisture. Grazing has brought about a shift in this system's plant composition by creating dense stands of big sagebrush and by shifting the dominant grasses from native perennials to annuals, particularly cheatgrass. Because cheatgrass produces abundant fine fuels, its spread increases fire risk. Because fire also enhances the spread of cheatgrass, the system has become highly vulnerable to a persistent cycle of wildfire and cheatgrass expansion.

Fire has also drastically altered shrub species composition given the indigenous shrubs generally are intolerant of frequent fires. Although not as big a problem as grazing, wildfire, or invasive plants, cropland expansion (especially where the soils are deeper) and development have fragmented some of this shrub-steppe.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Altered disturbance regimes	Fire and ground disturbance has degraded the habitat and has led to a loss of habitat diversity. Fire has a particularly strong impact to indigenous shrubs.	• Fire management • Vegetation management • Grazing/farm management	Integrated habitat restoration using prescribed fire, weed control, and seeding with native vegetation.
Fish and wildlife habitat loss or degradation	Habitat has been lost to agriculture, and development to a lesser degree.	• Environmental Review • Land acquisition • Land use planning • Private lands agreements	Acquisitions, conservation easements, landowner agreements, and restoration. Support creation of GMA-based Voluntary Stewardship Plans
Invasive and other problematic species	Invasive annual grasses (cheatgrass) and exotic weeds have degraded habitat and increase with fire.	• Invasive species control	Mechanical and herbicide control of invasive vegetation.

TEMPERATE FOREST

Overview

Temperate Forest includes 31 ecological systems comprised of native upland vegetation throughout a broad elevation range and wide distribution in Washington. Forests in this category vary from the dry forest types of the eastern Cascade Range to the rain forests along the Washington coast. Temperate Forests support numerous SCGN including the following species: 22 birds, 11 amphibians, 35 invertebrates, 25 mammals, six reptiles, and 31 anadromous or freshwater fishes.

The ecological system with the most closely associated SGCN is the Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest. This widespread eastern Washington system includes a number of closely associated SGCN birds (pygmy nuthatch, white-headed woodpecker, Mountain Quail, Great Gray Owl, Golden Eagle, and Flammulated Owl), Mammals (Lynx, Western Gray Squirrel) and Reptiles (California Mountain Kingsnake, Sharp-tailed Snake). Old growth forest structure, snags and downed wood are key habitat features for species closely associated with this system.

Ten ecological systems within this formation are profiled as ecological systems of concern, and eight are discussed in greater detail below. Two other ecological systems (North Pacific Maritime Mesic Subalpine Parkland and North Pacific Maritime Mesic-Wet Douglas-fir – Western Hemlock) are of special interest due to significant numbers of closely associated species. Within the Subalpine Parkland system, two SGCN mammals are closely associated, Olympic Marmot and Mazama Pocket Gopher. Other SGCN closely associated with this system include five invertebrates (Mardon skipper, Puget Blue, Puget Sound Fritillary, Valley Silverspot, and Western Bumblebee). Closely associated SGCN species within the Maritime Mesic-Wet Douglas-fir ecological system include two amphibians (Cascades Torrent Salamander, Dunn's Salamander) one reptile (Ringneck Snake), and two invertebrates (Johnson Hairstreak and Bluegray taildropper).

Formation Summary				
Distribution	**Public Land**	**Private Land**	**SGCN with close association (#)**	**SGCN with general association (#)**
28,929 mi^2	70%	30%	69	61

Ecological systems found in this formation	Number of SGCN	
	closely associated	generally associated
Columbia Plateau Western Juniper Woodland and Savanna	3	11
East Cascades Mesic Montane Mixed Conifer Forest	3	27
East Cascades Oak-Ponderosa Pine Forest and Woodland	7	12
Inter Mountain Basins Aspen-Mixed Conifer Forest	0	6
Inter Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland	0	2
Middle rocky Mountain Montane Douglas-fir Forest	1	7
North Pacific Broadleaf Landslide Forest and Shrubland	1	6
North Pacific Dry Douglas-fir (Madrone) Forest	5	18
North Pacific Dry-Mesic Sliver Fir Western Hemlock Douglas Fir Fores	4	28
North Pacific Hypermaritime Sitka Spruce Forest	2	21

North Pacific Hypermaritime Western Red-Cedar Western Hemlock Forest	3	22
North Pacific Lowland Mixed Hardwood-Conifer Forest	0	27
North Pacific Maritime Dry-Mesic Douglas fir Western Hemlock Forest	4	31
North Pacific Maritime Mesic Subalpine Parkland	7	16
North Pacific Maritime Mesic-Wet Douglas –fir-Western Hemlock Forest	5	30
North Pacific Mesic Western Hemlock Silver Fir Forest	0	21
North Pacific Mountain Hemlock Forest	1	19
North Pacific Oak Woodland	6	12
North Pacific Wooded Volcanic Flowage	1	3
North Pacific Seasonal Sitka Spruce Forest	0	6
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	11	26
Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	4	23
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	10	20
Northern Rocky Mountain Subalpine Woodland and Parkland	2	20
Northern Rocky Mountain Western Larch Savanna	0	12
Rocky Mountain Aspen Forest and Woodland	0	12
Rocky Mountain Lodgepole Pine Forest	2	20
Rocky Mountain Poor-site Lodgepole Pine Forest	1	10
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	3	17
Rocky Mountain Subalpine Mesic Spruce Fir Forest and Woodland	4	22

☐ Ecological System of Concern

Major stressors

1. Agricultural conversion in lower elevation areas
2. Conversion for development purposes
3. Intensive plantation forestry primarily in lower- and mid-elevation areas
4. Altered fire behavior in dry forest landscapes
5. Excessive grazing
6. Weed invasions
7. Climate change

Habitat needs for SGCN associated with this vegetation formation

Old-growth Forest - High Ecological Integrity	Old growth forest comprised of trees of a wide range of age, height and diameter distributions of living and dead trees which results in complex structure important to numerous species. Examples: Northern Spotted Owl nesting, roosting, and foraging habitat; Bald Eagle nesting and roosting habitat. Golden Eagle nesting in large ponderosa pines, White-headed Woodpecker foraging and nesting in ponderosa pine forests.
High microclimate diversity	Many of the butterflies use habitat of high microclimate diversity with few invasive plants and high diversity of native plants.
Snags and downed wood	Vertical structure and structure on the forest floor provide area for foraging wildlife such as woodpeckers and habitat for Northern Flying Squirrels, an important prey species for Northern Spotted Owl.

Actions needed to maintain habitat quality for SGCN

- Fire management (establishment of natural fire regimes)
- Establish longer forestry rotations
- Grazing management
- Invasive species control
- Habitat restoration, research, and native species restoration**.**
- Landowner agreements/incentives; acquisition/easements

Role of Climate Change

Increasing temperatures, decreased moisture availability, and altered fire regimes represent the most significant climate stressors to temperate forests. Altered fire regimes appear to be the greatest threat, particularly given fire suppression practices of the past century that have led to the invasion of shade-tolerant and fire-intolerant species and/or altered forest structure and composition (i.e., increased stand density, smaller diameter trees. Warmer temperatures and decreased moisture availability may increase insect outbreaks in some temperate forests. In general, North Pacific temperate forests likely exhibit less vulnerability to climate change than temperate forests of the East Cascades and Rocky Mountains.

Research and Data Needs

- Assess effectiveness of various restoration methods
- Assess ecological consequences of using silvicultural versus prescribed fire methods to restore and/or retain habitats (e.g. ponderosa pine forest and woodland).
- What is the range of ecological value (e.g. wildlife species occurrence) that might be expected to occur in these ecological systems depending on varying levels of anticipated or hypothesized protection or ecological restoration?
- Are there minimum patch sizes or levels of isolation that make patches usable or unusable for the SGCN that are closely associated?
- Continue biennial updates to the High Resolution Change Detection dataset for the Puget Sound basin; expand the analysis to include ESOCs and Priority Habitats statewide.

Ecological systems and other habitats discussed in greater detail in this section

A. East Cascades Oak-Ponderosa Pine Forest and Woodland
B. North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland
C. North Pacific Hypermaritime Sitka Spruce Forest
D. North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest
E. North Pacific Oak Woodland
F. Northern Rocky Mountain Ponderosa Pine Woodland and Savanna.
G. Northern Rocky Mountain Western Larch Savanna
H. Rocky Mountain Aspen Forest and Woodland

East Cascades Oak-Ponderosa Pine Forest and Woodland (ESOC)

Conservation Status and Concern

Fire suppression combined with grazing creates conditions that support cloning of oak and invasion by conifers resulting in denser stands. Seven terrestrial SGCN are closely associated with this ecological system and 12 are generally associated. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

This narrowly restricted ecological system appears at or near lower treeline in foothills of the eastern Cascade Range. Most occurrences of this system are dominated by a mix of Oregon white oak (*Quercus garryana)* and ponderosa pine or Douglas-fir. Scattered ponderosa pine or Douglas-fir comprise the upper canopy over Oregon white oak trees. Clonal Oregon white oak can create dense patches across a grassy landscape or can dominate open woodlands or savannas. Shrub-steppe vegetation may be prominent in some stands and create a distinct tree/shrub/sparse grassland habitat, including bitterbrush, big sagebrush and yellow rabbitbrush (*Chrysothamnus viscidiflorus*). The understory is generally dominated by herbaceous species, especially graminoids (grasses, sedges, and rushes). Mesic sites have an open- to-closed sodgrass understory dominated by pinegrass (*Calamagrostis rubescens*), Geyer's sedge (*Carex geyeri),* Ross' sedge (*Carex rossii*), or blue wildrye (*Elymus glaucus*). Drier savanna and woodland understories typically contain bunchgrass steppe species such as Idaho fescue (*Festuca idahoensis*) or bluebunch wheatgrass (*Pseudoroegneria spicata*). Common exotic grasses that often appear in high abundance are cheatgrass and bulbous bluegrass.

In the Columbia River Gorge, Oregon white oak can be found in dense patches often associated with grassland or shrubland balds within a closed Douglas-fir overstory forest landscape. The understory is often shrubby and composed of deerbrush (*Ceanothus integerrimus),* oceanspray, common snowberry (*Symphoricarpos albus*), and Pacific poison oak (*Toxicodendron diversilobum*). These woodlands occur at the lower treeline/ecotone between sagebrush (*Artemisia* spp.) or bitterbrush steppe or shrubland and ponderosa pine and/or *Douglas-fir* forests or woodlands. The matrix system occurs in the eastern Cascades in Washington and Oregon within 40 miles of the Columbia River Gorge. Elevations range from 1500 to 6300 feet. The Washington map was based on LANDFIRE data.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes, if Snags or Logs, or Old Growth/ Mature Forest Conditions are present	S1/S2	Imperiled/ declining	**MAMMALS:** American Badger, Gray Wolf, Hoary Bat, Silver-haired Bat, Townsend's Big-eared Bat, Western Gray Squirrel*
			BIRDS: Bald Eagle, Golden Eagle, Lewis' Woodpecker*, Pygmy Nuthatch*, White-headed Woodpecker
			REPTILES/AMPHIBIANS: Larch Mountain Salamander, Western Toad, California Mountain Kingsnake*, Ring-necked Snake*, Sharp-tailed Snake*, Western Pond Turtle*
			FISH: To be determined- research needed
			INVERTEBRATES: Mardon Skipper, a mayfly species (Paraleptophlebia jenseni)

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Fire suppression may support cloning of oak and invasion by conifers resulting in denser stands. This may be exacerbated by excessive grazing. Establishment of a natural fire regime is a key conservation action.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Altered disturbance regimes	Fire exclusion has resulted in tree and shrub encroachment.	• Fire management • Vegetation management • Invasive species control	Integrated habitat restoration using prescribed fire, weed control and seeding with natives.
Roads and development	Habitat has been lost to housing and subdivisions.	• Environmental review • Land acquisition • Land use planning • Private lands agreements	Acquisitions, conservation easements, landowner agreements, and restoration. Monitor and improve implementation of land use regulations (e.g., Growth Management Act).
Invasive and other problematic species	Invasive trees, forbs and shrubs are degrading habitat.	• Invasive species control	Mechanical and herbicide control of invasive species.

North Pacific Dry Douglas-Fir (Madrone) Forest and Woodland (ESOC)

Conservation Status and Concern

Clearcut or similar logging reduces canopy structural complexity and abundance of large woody debris. Fire suppression and climate change are significant threats to habitat for at least one SGCN species. There are five closely associated and 18 generally associated terrestrial SCGN that use this system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

Large and small patch system most common in the Puget Trough - Willamette Valley but found throughout western Washington and much of western Oregon. The Washington map was based on the recent modification of Washington's GAP map for Zone 1 (i.e. west side and east slope of the Cascades). Found in dry soils within relatively dry to mesic climates in the western Cascades, it can occur up to about 4000 feet elevation. With fire exclusion, stands have probably increased in tree density and grassy understories have been replaced by deciduous shrubs. Moderate to heavy grazing or other significant ground disturbance leads to increases in non-native invasive species, many of which are now abundant in stands with grassy or formerly grassy understories. Exotic herbaceous invaders include colonial bentgrass (*Agrostis capillaris*), common velvetgrass (*Holcus lanatus*), Kentucky bluegrass (*Poa pratensis)*, tall oatgrass (*Arrhenatherum elatius*), ripgut brome (*Bromus rigidus*), orchardgrass (*Dactylis glomerata*), bristly dogstail grass (*Cynosurus echinatus*), tall fescue (*Schedonorus arundinaceus*), and common St. John's wort (*Hypericum perforatum*).

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes If Snags or Logs, or Old Growth/ Mature Forest Conditions are present	S2	Imperiled/ declining Declines of 30-50% within the last 50 years. Declines of 70-80% from historical conditions	**MAMMALS:** Fisher, Gray Wolf, Hoary Bat, Keen's Myotis, Shaw Island Vole, Silver-haired Bat, Townsend's Big-eared Bat, Western Gray Squirrel, Western Spotted Skunk
			BIRDS: Bald Eagle, Marbled Murrelet, Peregrine Falcon, Slender-billed White-breasted Nuthatch, Western Bluebird, Western Screech Owl
			AMPHIBIANS: Western Toad
			FISH: To be determined- research needed
			INVERTEBRATES: Great Arctic*, Hoary Elfin*, Oregon Megomphix, Pacific Vertigo, Puget Sound Fritillary*, Taylor's Checkerspot*, Valley Silverspot*

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Maintenance of a natural fire regime is a key indicator of health

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Altered disturbance regimes	Fire exclusion has resulted in tree and shrub encroachment	• Fire management • Vegetation management	Integrated habitat restoration using prescribed fire, weed control and seeding with natives
Roads and development	Habitat has been lost to housing and subdivisions	• Environmental review • Land acquisition • Land use planning • Private lands agreements	Acquisitions, conservation easements, landowner agreements, and restoration Monitor and improve implementation of land use regulations (e.g., Growth Management Act).
Invasive and other problematic species	Invasive trees, forbs and shrubs are degrading habitat	• Invasive species control	Mechanical and herbicide control of invasive species
Forestry impacts	Clearcut or similar logging reduces canopy structural complexity and abundance of large woody debris.	• Environmental review • Land acquisition • Private lands agreements	Protect key sites through acquisition, easement, and planning.

North Pacific Hypermaritime Sitka Spruce Forest (ESOC)

Conservation Status and Concern

Historically this system was more extensive, but has been reduced by conversion to commercial forest and shorter harvest rotation. There are two closely associated and 21 generally associated terrestrial SCGN that use this ecological system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

This system is characterized by forests found in the outermost coastal fringe where salt spray is prominent and on riparian terraces and valley bottoms near the coast where there is abundant fog. Large patch system are restricted to the hypermaritime climatic areas near the Pacific Coast, along a fog belt from Point Arena, California, north to the Kenai Peninsula, Alaska. It is found below 1000 feet elevation and within 15 miles of the outer coast, and does not include swamp areas. Mild, wet climate with abundant summer fog are characteristic and annual precipitation ranges from 26 to 217 inches, with the majority falling as rain, which can be heavy. The Washington map is based on recent modification of Washington's GAP map for Zone 1 (i.e., west side and east slope of the Cascades).

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes If Snags or Logs, or Old Growth/ Mature Forest Conditions are present	S2	Imperiled/ declining Decline of 70-80% within last 50 years and from historical condition	**MAMMALS:** Fisher, Gray Wolf, Hoary Bat, Keen's Myotis, Pacific Marten (coastal population)*, Silver-haired Bat, Townsend's Big-eared Bat, Western Spotted Skunk
			BIRDS: Bald Eagle, Golden Eagle, Harlequin Duck, Marbled Murrelet, Northern Spotted Owl, Peregrine Falcon, Western Bluebird, Western Screech Owl
			AMPHIBIANS: Cope's Giant Salamander, Dunn's Salamander*, Olympic Torrent Salamander, Van Dyke's Salamander, Western Toad
			FISH: To be determined- research needed
			INVERTEBRATES: Crowned Tightcoil, Oregon Silverspot

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Many historical occurrences of this system have become conifer plantations and logging of remaining intact stands remains a threat. Clearcut logging and plantation forestry have resulted in less diverse tree canopies, and have focused mainly on Douglas-fir, with reductions in coarse woody debris, a shortened stand initiation phase, and succession truncated well before late-seral characteristics are expressed. Non-native species are also a potential threat to the persistence and ecological integrity of this ecological system. Developing longer stand rotations in managed lands, habitat restoration, and protection through a variety of methods are key conservation actions.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Roads and development	Habitat has been lost to housing and subdivisions.	• Environmental review • Land acquisition • Land use planning • Private lands agreements	Acquisitions, conservation easements, landowner agreements, and restoration. Monitor and improve implementation of land use regulations (e.g., Growth Management Act).
Forestry impacts	Intensive forestry that emphasizes shorter rotations and different species.	• Vegetation management	Integrated Habitat Restoration with native species.
Invasive/other problematic species	Invasive trees, forbs and shrubs are degrading habitat.	• Invasive species control	Mechanical and herbicide control of invasive species.

North Pacific Hypermaritime Western Red-cedar Western Hemlock Forest (ESOC)

Conservation Status and Concern

Fire suppression and climate change are significant threats to habitat for this ecological system. There are three closely associated and 22 generally associated terrestrial SCGN with this ecological system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

This is a coastal forest occurring in areas of low, gentle relief within 15 miles of the coast. Where these forests are best developed they occur in a mosaic with forested wetlands, bogs, and Sitka spruce forests (the latter in riparian areas and on steep, more productive soils). The matrix system occupies the outer coastal portions of British Columbia, southeastern Alaska, and Washington. Its center of distribution is the northern coast of British Columbia, as western redcedar (*Thuja plicata*) approaches its northernmost limit in the southern half of southeastern Alaska.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes If Snags or Logs, or Old Growth/ Mature Forest Conditions are present	S2	Imperiled/ declining Declines of 70-80% within last 50 years Declines of 50-70% from historical	**MAMMALS:** Fisher, Gray Wolf, Hoary Bat, Keen's Myotis, Pacific Marten (coastal population), Silver-haired Bat, Townsend's Big-eared Bat, Western Spotted Skunk
			BIRDS: Bald Eagle, Golden Eagle, Harlequin Duck, Marbled Murrelet, Northern Spotted Owl, Peregrine Falcon, Western Bluebird, Western Screech Owl
			AMPHIBIANS: Dunn's Salamander*, Cope's Giant Salamander, Olympic Torrent Salamander, Van Dyke's Salamander, Western Toad
			FISH: To be determined- research needed

			INVERTEBRATES: Bluegray Taildropper*, Johnson's Hairstreak*, Oregon Silverspot, Puget Oregonian

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

These forests very rarely burn and are more influenced by gap disturbance processes and intense windstorms than by fire. Many historical occurrences of this system have become conifer plantations and logging of remaining intact stands remains a threat. Clear-cut logging and plantation forestry have resulted in less diverse tree canopies, and have focused mainly on Douglas-fir, with reductions in coarse woody debris, a shortened stand initiation phase, and succession truncated well before late-seral characteristics are expressed. Non-native species are also a potential threat to the persistence and ecological integrity of this ecological system.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Forestry impacts	Intensive forestry that emphasizes shorter rotations and different species.	Vegetation management	Integrated habitat restoration with native species.
Roads and development	Habitat has been lost to housing and subdivisions.	• Environmental review • Land acquisition • Land use planning • Private lands agreements	Acquisitions, conservation easements, landowner agreements, and restoration. Monitor and improve implementation of land use regulations (e.g., Growth Management Act).

North Pacific Oak Woodland (ESOC)

Conservation Status and Concern

Due to historical loss of habitat, and ongoing threats from invasive species and development, conservation action is critical for conservation of this ecological system and associated SGCN. There are seven terrestrial SGCN species that are closely associated with this ecological system and 12 that are generally associated. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

This oak woodland is most prevalent on gravelly outwash plains in Thurston and Pierce counties but is found on dry sites that experienced frequent pre-settlement fires in other part of the Puget Trough including parts of Jefferson, Clallam, Island and San Juan Counties. This system occurs as either large or small patches. The sporadic distribution and often small patch size of component parts of this system often limits visibility of mapped occurrences, thus the map also displays the counties in which the system is known to occur. The presence of Oregon white oak either as single species patches or where mixed with conifers characterizes these woodlands. East of the Cascade Crest is a different system dominated by Oregon white oak (i.e., East Cascades Oak-Ponderosa Pine Forest and Woodland).

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes Oregon White Oak Woodlands	S1	Critically imperiled/ declining. Rate of decline unknown.	**MAMMALS:** Hoary Bat, Keen's Myotis, Mazama Pocket Gopher, Silver-haired Bat, Townsend's Big-eared Bat, Western Gray Squirrel*
			BIRDS: Bald Eagle, Slender-billed White-breasted Nuthatch*, Western Bluebird, Western Screech Owl
			REPTILES/AMPHIBIANS: Oregon Spotted Frog, Western Toad**,** Western Pond Turtle*
			FISH: To be determined- research needed
			INVERTEBRATES: Mardon Skipper, Propertius' Duskywing*, Puget Sound Fritillary*, Taylor's Checkerspot*, Valley Silverspot*

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

This ecological system is relatively limited in area and is currently declining in extent and condition. With the cessation of regular fires, many oak woodlands have been invaded by a greater density of trees that alters the structure and function of woodlands and interferes with successional dynamics such as recruitment. Some areas have been lost to urban or agriculture development. Ongoing threats include residential development, increase and spread of exotic species, and fire suppression effects. Selective logging of Douglas-fir in oak woodlands can prevent long-term loss of oak dominance. Moderate to heavy grazing can lead to an increase in non-native plant species, many of which are now abundant. Maintenance of a natural fire regime is a key conservation action.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Altered disturbance regimes	Fire exclusion has resulted in tree and shrub encroachment	• Fire management • Vegetation management • Invasive species control	Integrated habitat restoration using prescribed fire, weed control and seeding with native species
Roads and development	Habitat has been lost to housing and subdivisions	• Environmental review • Land acquisition • Land use planning • Private lands agreements	Acquisitions, conservation easements, landowner agreements, and restoration Monitor and improve implementation of land use regulations (e.g., Growth Management Act).
Invasive and other problematic species	Invasive trees, forbs and shrubs are degrading habitat	• Invasive species control	Mechanical and herbicide control of invasive species

Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (ESOC)

Conservation Status and Concern

Fire suppression and climate change are significant threats to this ecological system. Housing and development is increasingly moving into this habitat. There are 10 terrestrial SGCN that are closely associated with this ecological system and 20 SGCN that are generally associated. Although a complete analysis has not been done for all SGCN anadromous and freshwater fishes, several appear closely associated with this system, e.g., Upper Columbia Steelhead DPS, and Upper Columbia Spring Chinook Salmon ESU.

Description and Distribution

These woodlands and savannas are, or at least historically were, fire-maintained and occur at the lower treeline/ecotone between grasslands or shrublands at lower elevations and more mesic coniferous forests at higher elevations. This is the predominant ponderosa pine system of eastern Washington. This system occurs in the foothills of the northern Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes If Snags or Logs, or Old Growth/ Mature Forest Conditions are present	S2	Imperiled/ declining	**MAMMALS:** American Badger, American Pika, Gray Wolf, Grizzly Bear, Hoary Bat, Silver-haired Bat, Spotted Bat, Townsend's Big-eared Bat, Western Gray Squirrel*
			BIRDS: Bald Eagle, Flammulated Owl*, Golden Eagle, Harlequin Duck, Lewis' Woodpecker, Mountain Quail*, Northern Spotted Owl, Peregrine Falcon, Pygmy Nuthatch*, White-headed Woodpecker*
			REPTILES/AMPHIBIANS: Columbia Spotted Frog, Tiger Salamander, Western Toad, California Mountain Kingsnake*, Desert Nightsnake, Ring-necked Snake*, Sharp-tailed Snake*, Pygmy Short-horned Lizard
			FISH: To be determined- research needed
			INVERTEBRATES: Chelan Mountainsnail*, Hoder's Mountainsnail, Mardon Skipper*

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

Pre-1900, this system was a mosaic of forest containing a substantial area of open and park like forest with few understory trees. Currently, much of this system has a younger tree cohort often including more shade-tolerant species, resulting in a more closed, multilayered canopy in patches that include older trees. Fire suppression has led to a buildup of fuels (e.g. higher density of trees, inter-connecting canopies of trees, multiple heights classes of trees) that in turn increase the likelihood of stand-replacing fires. Heavy grazing, in contrast to fire, removes the grass cover and tends to favor shrub and conifer species. Fire suppression combined with grazing creates conditions that support invasion by conifers. Large late-seral ponderosa pine and Douglas-fir are harvested in much of this habitat. Under most management regimes, typical tree size decreases and tree density increases in this habitat. Maintenance of a natural fire regime and longer stand rotation are key conservation actions.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Altered disturbance regimes	Fire exclusion has resulted in tree and shrub encroachment	• Fire management • Vegetation management	Integrated habitat restoration using prescribed fire, weed control and seeding with natives
Fish and wildlife habitat loss or degradation	Habitat has been lost to agriculture, and development	• Environmental Review • Land acquisition • Land use planning • Private lands agreements	Acquisitions, conservation easements, landowner agreements, and restoration. Monitor and improve implementation of land use regulations (e.g., GMA).
Invasive and other problematic species	Invasive trees, forbs and shrubs are degrading habitat	• Invasive species control	Mechanical and herbicide control of invasive species

Northern Rocky Mountain Western Larch Savanna (ESOC)

Conservation Status and Concern

This is a fire-dependent system and was much more extensive in the past; it is now very patchy in distribution. Fire suppression has led to invasion of the more shade-tolerant tree species grand fir (*Abies grandis*), subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*), or hemlock species (*Tsuga* spp.) and loss of much of the single-story canopy woodlands. Fire suppression and climate change are significant threats. There are 12 terrestrial SCGN species that are generally associated with this ecological system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

This large patch system is restricted to the interior montane zone of the Pacific Northwest in northern Idaho and adjacent Montana, Washington, Oregon, and southeastern British Columbia. The Washington map is based on recent modification of Washington's GAP map for Zone 1 (i.e. east slope of the Cascades) and LANDFIRE data. The sporadic distribution of this system limits visibility of mapped occurrences, thus the map also displays the counties in which the system is known to occur. There may be remnant stands in Yakima and Klickitat counties. Elevations range from 2230 to 7200 feet, and sites include drier, lower montane settings of toe slopes and ash deposits. Winter snowpack typically melts off in early spring at lower elevations.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes If Snags or Logs, or Old Growth /Mature Forest Conditions are present	S1	Critically imperiled/ declining	**MAMMALS:** American Pika, Cascade Red Fox, Gray Wolf, Grizzly Bear, Hoary Bat, Silver-haired Bat, Townsends Big-eared Bat, Wolverine
			BIRDS: Bald Eagle, Golden Eagle, Lewis' Woodpecker
			AMPHIBIANS: Columbia Spotted Frog
			FISH: To be determined- research needed

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

This is a fire-dependent system and was much more extensive in the past; it is now very patchy in distribution. Fire suppression has led to invasion of the more shade-tolerant tree species such as grand fir, subalpine fir, Engelmann spruce, or hemlock species and loss of much of the single-story canopy woodlands. Maintenance of a natural fire regime is a key conservation action.

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Altered disturbance regimes	Fire exclusion has resulted in tree and shrub encroachment	• Fire management • Vegetation management • Invasive species control	Integrated habitat restoration using prescribed fire, weed control and seeding with natives
Roads and development	Habitat has been lost to housing and subdivisions	• Environmental review • Land acquisition • Land use planning • Private lands agreements	Acquisitions, conservation easements, landowner agreements, and restoration Monitor and improve implementation of land use regulations (e.g., GMA).

Rocky Mountain Aspen Forest and Woodland (ESOC)

Conservation Status and Concern

Conifers now dominate many seral aspen stands and extensive stands of young aspen are uncommon. Heavy livestock browsing can adversely impact aspen growth and regeneration. With fire suppression and alteration of fine fuels, fire rejuvenation of aspen habitat has been greatly reduced since about 1900. There are 12 generally associated terrestrial SCGN that use this ecological system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

Description and Distribution

Aspen forests and woodlands are a minor type found on the east side of the North Cascades and in the Okanogan. Although aspen can be associated with streams, ponds, or wetlands, this system consists of upland aspen stands found from low to moderate elevation. This widespread, large patch system is very common in the southern and central Rocky Mountains but occurs in the montane and subalpine zones throughout much of the western U.S. and north into Canada. The Washington map is based on recent modification of Washington's GAP map for Zone 1 (i.e. west side and east slope of the Cascades). The sporadic distribution of this system limits visibility of mapped occurrences, thus the map also displays the counties in which the system is known to occur. It often occurs on well-drained mountain slopes or canyon walls that have some moisture. Rockfalls, talus, or stony north slopes are often typical sites and the system may occur in steppe on moist microsites.

PHS	NHP Rank	Status and trend	SGCN closely and generally associated with this ecological system
Yes. Snags and Logs and Aspen Stands	S2	Imperiled/ declining Declines of 50-70% within the last 50 years.	**MAMMALS:** Gray Wolf, Grizzly Bear, Hoary Bat, Lynx, Silver-haired Bat, Townsend's Big-eared Bat
			BIRDS: Bald Eagle, Harlequin Duck, Lewis' Woodpecker
			AMPHIBIANS: Columbia Spotted Frog , Western Toad
			FISH: To be determined- research needed
			INVERTEBRATES: Mardon Skipper

* SGCN is closely associated with this ecological system

Stressors and Actions Needed

STRESSOR	DESCRIPTION	ACTION CATEGORY	ACTION DESCRIPTION
Altered disturbance regimes	Fire exclusion has resulted in tree and shrub encroachment, loss of habitat diversity	• Fire management • Vegetation management • Invasive species control	Integrated habitat restoration using prescribed fire, weed control and seeding with natives
Roads and development	Habitat has been lost to housing and subdivisions	• Environmental review • Land acquisition • Land use planning • Private lands agreements	Acquisitions, conservation easements, landowner agreements, and restoration Monitor and improve implementation of land use regulations (e.g., GMA).

MARINE ECOLOGICAL SYSTEMS

Overview

Seven marine ecological systems that occur in Puget Sound and Washington's Pacific coast are described in Table 4-2 and include Temperate Pacific Tidal Salt and Brackish Marsh, Temperate Pacific Intertidal Mudflat, North Pacific Maritime Eelgrass Bed, Estuarine, Nearshore, Offshore, and Oceanic. Below, we provide information on the SGCN generally and closely associated with these systems, and following, a summary of key stressors, habitat values and actions needed.

Ecological System	SGCN with close* and general association
TEMPERATE PACIFIC TIDAL AND BRACKISH MARSH	**MAMMALS:** Shaw Island Vole **BIRDS:** Bald Eagle, Barrow's Goldeneye, Black Scoter, Brown Pelican, Common Loon, Dusky Canada Goose, Harlequin Duck, Marbled Godwit, Peregrine Falcon, Purple Martin, Red-necked Grebe, Surf Scoter, Western High Arctic Brant, White-winged Scoter **FISH:** Eulachon-southern DPS, Pacific Lamprey, Puget Sound Chinook Salmon ESU, Lower Columbia River Chinook Salmon ESU, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU, Columbia River Chum Salmon ESU, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Snake River Basin Steelhead DPS, Bull Trout-Coastal Recovery Unit **INVERTEBRATES:** Island Marble*, Oregon Silverspot, Taylor's Checkerspot, Valley Silverspot
NORTH PACIFIC MARITIME EELGRASS BED	**BIRDS:** Bald Eagle, Common Loon, Harlequin Duck*, Marbled Godwit*, Peregrine Falcon, Red Knot*, Western High Arctic Brant* **FISH:** Broadnose Sevengill Shark, Bocaccio-Puget Sound/Georgia Basin DPS, Brown Rockfish, Copper Rockfish, Quillback Rockfish, Pacific Cod-Salish Sea population, Pacific Herring-Georgia Basin DPS*, Pacific Sand Lance, Surf Smelt, Walleye Pollock-South Puget Sound, Pacific Lamprey, River Lamprey, Green Sturgeon-southern DPS, White Sturgeon-Columbia River, Puget Sound Chinook Salmon ESU, Lower Columbia River Chinook Salmon ESU, Upper Columbia River Spring Chinook Salmon ESU, Snake River Spring/Summer Chinook Salmon ESU, Snake River Fall Chinook Salmon ESU, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU, Columbia River Chum Salmon ESU, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Snake River Basin Steelhead DPS, Bull Trout-Coastal Recovery Unit
TEMPERATE PACIFIC INTERTIDAL MUDFLAT	**BIRDS:** Bald Eagle, Marbled Godwit*, Peregrine Falcon, Purple Martin, Red Knot*, Western High Arctic Brant, Western Snowy Plover **FISH:** Green Sturgeon-southern DPS, White Sturgeon-Columbia River, Puget Sound Chinook Salmon ESU, Hood Canal Summer Chum Salmon ESU, Columbia River Chum Salmon ESU

Ecological System	SGCN with close* and general association
ESTUARINE	**MAMMALS:** Killer Whale, Sea Otter **BIRDS:** Bald Eagle, Brown Pelican, Common Loon, Dusky Canada Goose*, Harlequin Duck, Marbled Murrelet, Peregrine Falcon, Red-necked Grebe, Surf Scoter*, Western Grebe, Western High Arctic Brant*, White-winged Scoter* **FISH:** Bluntnose Sixgill Shark, Broadnose Sevengill Shark*, Pacific Herring-Georgia Basin DPS, Pacific Sand Lance, Surf Smelt, Eulachon-southern DPS, Pacific Lamprey, River Lamprey, Green Sturgeon-southern DPS, White sturgeon-Columbia River*, Puget Sound Chinook Salmon ESU, Lower Columbia River Chinook Salmon ESU*, Upper Columbia River Spring Chinook Salmon ESU, Snake River Spring/Summer Chinook Salmon ESU, Snake River Fall Chinook Salmon ESU, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU*, Columbia River Chum Salmon ESU*, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Snake River Basin Steelhead DPS, Bull Trout-Coastal Recovery Unit
NEARSHORE	**MAMMALS:** Gray Whale, Humpback Whale, Killer Whale, Sea Otter **BIRDS:** Bald Eagle, Barrow's Goldeneye, Brown Pelican, Clark's Grebe, Common Loon*, Dusky Canada Goose*, Harlequin Duck, Marbled Murrelet*, Peregrine Falcon, Red-necked Grebe, Surf Scoter*, Tufted Puffin, Western Grebe*, Western High Arctic Brant, White-winged Scoter* **FISH:** Bluntnose Sixgill Shark, Broadnose Sevengill Shark*, Bocaccio-Puget Sound/Georgia Basin DPS, Brown Rockfish, Canary Rockfish-Puget Sound/Georgia Basin DPS, Copper Rockfish*, Greenstriped Rockfish, Redstripe Rockfish, Tiger Rockfish, Quillback Rockfish, Yelloweye Rockfish-Puget Sound/Georgia Basin DPS, Pacific Cod-Salish Sea Population, Pacific Hake-Georgia Basin DPS, Pacific Herring-Georgia Basin DPS*, Pacific Sand Lance*, Surf Smelt*, Walleye Pollock-South Puget Sound, Eulachon-Southern DPS, Pacific Lamprey, River Lamprey, Green Sturgeon-Southern DPS, White Sturgeon-Columbia River*, Puget Sound Chinook Salmon ESU, Lower Columbia River Chinook Salmon ESU, Upper Columbia River Spring Chinook Salmon ESU, Snake River Spring/Summer Chinook Salmon ESU, Snake River Fall Chinook Salmon ESU, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU*, Columbia River Chum Salmon ESU, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Snake River Basin Steelhead DPS, Ozette Sockeye ESU, Bull Trout-Coastal Recovery Unit

Ecological System	SGCN with close* and general association
OFFSHORE	**MAMMALS:** Gray Whale, Humpback Whale, Killer Whale, Minke Whale, Sea Otter, **BIRDS:** Brown Pelican**,** Clark's Grebe, Common Loon*, Dusky Canada Goose*, Marbled Murrelet*, Peregrine Falcon, Red-necked Grebe*, Surf Scoter*, Tufted Puffin, Short-tailed Albatross, Western Grebe*, Western High Arctic Brant, White-winged Scoter* **FISH:** Bluntnose Sixgill Shark, Broadnose Sevengill Shark, Bocaccio-Puget Sound/Georgia Basin DPS, Brown Rockfish, Canary Rockfish-Puget Sound/Georgia Basin DPS, Copper Rockfish, Greenstriped Rockfish, Redstripe Rockfish, Tiger Rockfish, Quillback Rockfish, Yelloweye Rockfish-Puget Sound/Georgia Basin DPS, Pacific Cod-Salish Sea Population, Pacific Hake-Georgia Basin DPS, Pacific Herring-Georgia Basin DPS, Pacific Sand Lance, Surf Smelt, Walleye Pollock-South Puget Sound, Eulachon-southern DPS, Pacific Lamprey, Green Sturgeon-southern DPS, White Sturgeon-Columbia River, Puget Sound Chinook Salmon ESU, Lower Columbia River Chinook Salmon ESU, Upper Columbia River Spring Chinook Salmon ESU, Snake River Spring/Summer Chinook Salmon ESU, Snake River Fall Chinook Salmon ESU, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU, Columbia River Chum Salmon ESU, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Snake River Basin Steelhead DPS, Ozette Sockeye ESU, Bull Trout-Coastal Recovery Unit
OCEANIC	**MAMMALS:** North Pacific Right Whale*, Blue Whale*, Fin Whale*, Gray Whale, Humpback Whale, Killer Whale, Minke Whale, Sei Whale*, Sperm Whale* **BIRDS:** Short-tailed Albatross*, Tufted Puffin **FISH:** Bluntnose Sixgill Shark*, Puget Sound Chinook Salmon ESU, Lower Columbia River Chinook Salmon ESU, Upper Columbia River Spring Chinook Salmon ESU, Snake River Spring/Summer Chinook Salmon ESU, Snake River Fall Chinook Salmon ESU, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Snake River Basin Steelhead DPS

*SGCN is closely associated with this system

Major Stressors

Invasive species such as saltmarsh cordgrass (*Spartina alterniflora*) and the European Green Crab (*Carcinus maenas*), coastal development, overharvesting (fish and shellfish species), degraded water quality and climate change are all stressors which threaten the habitat values provided by these systems.

Degraded water quality resulting from land use practices have altered significant portions of the shallow marine systems and continue to alter remaining areas. The physical and chemical conditions of these habitats are degraded by the discharge of municipal, industrial, and agricultural effluents. The pollutants emitted by these sources have harmful impacts throughout marine food webs, but especially at the highest trophic levels. Invasions of non-native plants and animals pose significant long-term ecological and economic threats to this habitat.

Other threats include declining prey resources, for example forage fish for seabirds and Chinook Salmon for southern resident killer whales.

Sea level rise is the most significant climate change stressor for the salt and brackish marshes, leading to submergence of tidal salt marshes and declines in vegetation unless they are able to migrate inwards through sediment accretion. Nearshore and estuarine systems will also be affected by sea level rise, as well as impacts from increased wave height and intensity and increasing water temperatures. Oceanic systems are at risk from changing ocean chemistry and rising levels of acidification, which has already been affecting the viability of oysters and other shellfish in Puget Sound.

Habitat needs for SGCN associated with marine systems

Fish/invertebrate spawning grounds	Many of these systems provide essential spawning habitat for forage fish and other species.
High invertebrate diversity/abundance	Invertebrates in mudflats are food for many of these species like Harlequin Duck and Marbled Godwit.
High water quality	Water must lack high levels of pollutants and have appropriate physiochemical attributes (temperature, salinity, etc.).

Actions needed to maintain habitat quality for SGCN

- Invasive species control.
- Improvements to water quality, discharge from human development (variety of sources)
- Minimize risks from oil spills.
- Broad recovery of forage fish in the Salish Sea and outer coast would benefit a number of marine SGCN. In particular, development of appropriate land use planning that adequately protects spawning beaches for sand lance and surf smelt.
- Actions to reduce underwater anthropogenic noise would be beneficial for nearly all marine mammal SGCNs.

Research and Data Needs

- Areas used by life history stages and movements of juveniles before selection of adult habitat is poorly understood for many of our SGCN marine fishes, especially rockfish.
- Population, life history, and distribution information is needed for both shark species.
- Track and monitor evidence and effects of changing sea levels.

4.3 PUTTING IT ALL TOGETHER: PRIORITY LANDSCAPES INITIATIVE

The Priority Landscapes Initiative is a new effort intended to identify statewide priorities and provide a framework for place-based collaborative work aimed at preserving landscape conservation values throughout Washington State.

This initiative is one avenue by which the agency intends to link the conservation priorities identified for SGCN with those for our most important habitats and Ecological Systems of Concern and identify landscape level actions to benefit them. Products of the initiative will include the identification of specific geographies where landscape level conservation actions will have broad benefit across ecological systems and SGCN.

Between 2015 and 2017, WDFW intends to identify landscape level priorities statewide, and also to select two to four areas to be the near-term focus of efforts to promote collaborative conservation aimed at improving habitat conditions for wildlife.

4.3.1 Criteria for Priority Landscapes

The selection criteria is generally a combination of agency priorities for conservation (in part identified through the State Wildlife Action Plan), and an assessment of the readiness of local communities and constituents to engage in a place-based collaborative conservation. Specific criteria will likely include:

- Conservation benefit to SGCN/ecological systems of concern
- Priority for species recovery plans and/or a habitat connectivity priority
- Conservation partner priorities (including local governments, land trusts, conservation NGOs, federal and state partners, farming and forestry associations, tribes, etc.)
- Momentum, and political support and funding availability

Preliminary results indicate potential Priority Landscapes in marine/nearshore systems, urban/wild interface and in agriculture and forested landscapes. Our focus in the next phase of action is to develop a list of gaps (conservation needs that are still unmet in these landscapes) to focus on in the next 10 years.

4.4 REFERENCE INFORMATION

4.4.1 Definition of Terms

PHS (Priority Habitats and Species Program)
A Priority Species under the PHS program is considered to be a priority for conservation and management and requires protective measures for survival due to population status, sensitivity to habitat alteration, and/or tribal, recreational or commercial importance. Priority Habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. Management recommendations have been developed for PHS habitats to assist landowners, managers and others in conducting land use activities in a manner that incorporates the needs of fish and wildlife. Providing jurisdictions and others with site-scale applications of Management Recommendations is a responsibility of local Habitat Biologists. A complete list of PHS Species and Habitats is available here.

Public Ownership
Public Ownership – Property owned by government entities including cities or municipal governments, counties, state agencies, federal agencies, and tribes.

Private Ownership
Private Land Ownership – Land owned by individuals or non-government organizations.
Natural Heritage Program (more, ranking guide)

NHP Rank (Natural Heritage Program Rank)
The Washington Natural Heritage Program assigned conservation status ranks to Washington's ecological systems using NatureServe's Conservation Status Rank calculator. The Conservation Status Rank is a measure of an ecological system's elimination risk. The rank is calculated using a measure of eight core factors relevant to risk assessment of elimination. The factors are organized into three categories: rarity, threats, and trends. Factors are scaled and weighted and subsequently scored according to their impact on risk. Scores are combined by category resulting in an overall calculated rank, which is reviewed by the user, and a final conservation status rank is assigned. The Conservation Status Rank calculator automates the process of assigning conservation status ranks across the network thereby improving standardization of rank assignments. WDFW identified systems with S1, S1S2, and S2 as ecological systems of concern.

4.4.2 General references

- Supporting documents for the EIAs can be found at: http://www1.dnr.wa.gov/nhp/refdesk/communities/eia.html

- Documentation about ecological systems can be found at: http://www1.dnr.wa.gov/nhp/refdesk/communities/ecol_systems.html

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Crosswalk between Formations, Ecological Systems and Priority Habitats and Species (PHS) Categories

Table 4-5: National Vegetation Classification/PHS Crosswalk

Formation	Ecological System	ESOC[1]	Associated PHS Habitat
Alpine Cliff, Scree & Rock Vegetation	North Pacific Alpine and Subalpine Bedrock and Scree	no	Talus
	Rocky Mountain Alpine Bedrock and Scree	no	Talus
	North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fell-field and Meadow	no	
	Rocky Mountain Alpine Fell-Field	no	
	Rocky Mountain Alpine Tundra/Fell-field/Dwarf-shrub Map Unit	no	
Barren	North American Alpine Ice Field	no	
	Unconsolidated Shore	no	
Bog & Fen	North Pacific Bog and Fen	yes	Freshwater Wetlands and Fresh Deepwater
	Rocky Mountain Subalpine-Montane Fen	no	Freshwater Wetlands and Fresh Deepwater
Cliff, Scree & Rock Vegetation	North Pacific Montane Massive Bedrock, Cliff and Talus	no	Talus
	Rocky Mountain Cliff, Canyon and Massive Bedrock	no	Cliffs
Current and Historic Mining Activity	Quarries, Mines, Gravel Pits and Oil Wells	no	
Developed & Urban	Developed, High Intensity	no	
	Developed, Low Intensity	no	
	Developed, Medium Intensity	no	
	Developed, Open Space	no	
Flooded and Swamp Forest	Columbia Basin Foothill Riparian Woodland and Shrubland	yes	Riparian
	Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	no	Riparian
	Inter-Mountain Basins Montane Riparian Systems	no	Riparian
	North Pacific Hardwood-Conifer Swamp	yes	Freshwater Wetlands and Fresh Deepwater
	North Pacific Lowland Riparian Forest and Shrubland	yes	Riparian
	North Pacific Montane Riparian Woodland and Shrubland	no	Riparian
	North Pacific Shrub Swamp	no	Freshwater Wetlands and Fresh Deepwater
	Northern Rocky Mountain Conifer Swamp	no	Freshwater Wetlands and Fresh Deepwater
	Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland	yes	Riparian
	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	no	Riparian
	Rocky Mountain Subalpine-Montane Riparian Woodland	no	Riparian

[1] Ecological System of Concern

Formation	Ecological System	ESOC[1]	Associated PHS Habitat
Freshwater Aquatic Vegetation	Temperate Pacific Freshwater Aquatic Bed	no	Freshwater Wetlands and Fresh Deepwater
Freshwater Wet Meadow & Marsh	Columbia Plateau Vernal Pool	no	Freshwater Wetlands and Fresh Deepwater
	North American Arid West Emergent Marsh	yes	Freshwater Wetlands and Fresh Deepwater
	North Pacific Avalanche Chute Shrubland	no	
	North Pacific Intertidal Freshwater Wetland	yes	Freshwater Wetlands and Fresh Deepwater
	Rocky Mountain Alpine-Montane Wet Meadow	no	Freshwater Wetlands and Fresh Deepwater?
	Rocky Mountain Subalpine-Montane Riparian Shrubland	no	Riparian
	Temperate Pacific Freshwater Emergent Marsh	yes	Freshwater Wetlands and Fresh Deepwater
	Temperate Pacific Freshwater Mudflat	yes	Freshwater Wetlands and Fresh Deepwater
	Temperate Pacific Montane Wet Meadow	no	Freshwater Wetlands and Fresh Deepwater
	Willamette Valley Wet Prairie	yes	Westside Prairie
Grassland, Meadow & Shrubland	Columbia Basin Foothill and Canyon Dry Grassland	yes	Eastside Steppe
	Columbia Basin Palouse Prairie	yes	Eastside Steppe
	North Pacific Alpine and Subalpine Dry Grassland	no	
	North Pacific Herbaceous Bald and Bluff	no	Herbaceous Bald
	North Pacific Hypermaritime Shrub and Herbaceous Headland	no	Nearshore - Open Coast
	North Pacific Montane Shrubland	no	
	Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland	no	Eastside Steppe
	Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	no	
	Northern Rocky Mountain Subalpine Deciduous Shrubland	no	
	Northern Rocky Mountain Subalpine-Upper Montane Grassland	no	Eastside Steppe
	Rocky Mountain Subalpine-Montane Mesic Meadow	no	
	Willamette Valley Upland Prairie and Savanna	yes	Westside Prairie
Herbaceous Agricultural Vegetation	Cultivated Cropland	no	
	Pasture/Hay	no	
Introduced & Semi Natural Vegetation	Introduced Riparian and Wetland Vegetation	no	Riparian; Freshwater Wetlands and Fresh Deepwater
	Introduced Upland Vegetation - Annual Grassland	no	
	Introduced Upland Vegetation - Perennial Grassland and Forbland	no	
	Introduced Upland Vegetation - Shrub	no	
Marine & Estuarine	North Pacific Maritime Eelgrass Bed	no	Nearshore - Open Coast; Nearshore - Coastal; Nearshore - Puget Sound

Formation	Ecological System	ESOC[1]	Associated PHS Habitat
Saltwater Aquatic Vegetation	Temperate Pacific Intertidal Mudflat	no	Nearshore - Open Coast; Nearshore - Coastal; Nearshore - Puget Sound
Open Water	Open Water (Fresh)	no	Freshwater Wetlands and Fresh Deepwater; Instream
Recently Disturbed or Modified	Disturbed, Non-specific	no	
	Harvested Forest - Grass/Forb Regeneration	no	
	Harvested Forest - Northwestern Conifer Regeneration	no	
	Harvested Forest-Shrub Regeneration	no	
	Recently burned forest	no	Snags and logs
	Recently burned grassland	no	
	Recently burned shrubland	no	
Salt Marsh	Inter-Mountain Basins Alkaline Closed Depression	yes	Freshwater Wetlands and Fresh Deepwater
	Inter-Mountain Basins Greasewood Flat	yes	
	Inter-Mountain Basins Playa	no	
	Temperate Pacific Tidal Salt and Brackish Marsh	yes	Nearshore - Coastal; Nearshore - Puget Sound
Scrub & Herb Coastal Vegetation	North Pacific Coastal Cliff and Bluff	no	Nearshore - Open Coast Cliffs
	North Pacific Maritime Coastal Sand Dune and Strand	yes	Nearshore - Coastal; Nearshore - Puget Sound
Semi-Desert Cliff, Scree & Rock Vegetation	Columbia Plateau Ash and Tuff Badland	no	
	Inter-Mountain Basins Active and Stabilized Dune	yes	Inland Dunes
	Inter-Mountain Basins Cliff and Canyon	no	Cliffs; Talus
Semi-Desert Scrub & Grassland	Columbia Plateau Low Sagebrush Steppe	yes	Shrub-steppe
	Columbia Plateau Scabland Shrubland	no	Shrub-steppe
	Columbia Plateau Steppe and Grassland	yes	Eastside Steppe
	Inter-Mountain Basins Big Sagebrush Shrubland	no	Shrub-steppe
	Inter-Mountain Basins Big Sagebrush Steppe	yes	Shrub-steppe
	Inter-Mountain Basins Mixed Salt Desert Scrub	no	Shrub-steppe
	Inter-Mountain Basins Montane Sagebrush Steppe	no	Shrub-steppe
	Inter-Mountain Basins Semi-Desert Grassland	no	
	Inter-Mountain Basins Semi-Desert Shrub Steppe	yes	Shrub-steppe
Temperate Forest	Columbia Plateau Western Juniper Woodland and Savanna	no	Juniper Savannah
	East Cascades Mesic Montane Mixed-Conifer Forest and Woodland	no	Old Growth - Mature Forest; Snags and Logs
	East Cascades Oak-Ponderosa Pine Forest and Woodland	yes	Old Growth - Mature Forest; Snags and Logs; Oregon White-oak Woodland
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	no	Aspen Stands
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland	no	
	Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	no	Old Growth - Mature Forest; Snags and Logs

Formation	Ecological System	ESOC[1]	Associated PHS Habitat
Temperate Forest	North Pacific Broadleaf Landslide Forest and Shrubland	no	
	North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland	yes	Old Growth - Mature Forest; Snags and Logs
	North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest	no	Old Growth - Mature Forest; Snags and Logs
	North Pacific Hypermaritime Sitka Spruce Forest	yes	Old Growth - Mature Forest; Snags and Logs
	North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest	yes	Old Growth - Mature Forest; Snags and Logs
	North Pacific Lowland Mixed Hardwood-Conifer Forest and Woodland	no	Old Growth - Mature Forest; Snags and Logs
	North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest	no	Old Growth - Mature Forest; Snags and Logs
	North Pacific Maritime Mesic Subalpine Parkland	no	Old Growth - Mature Forest; Snags and Logs
	North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest	no	Old Growth - Mature Forest; Snags and Logs
	North Pacific Mesic Western Hemlock-Silver Fir Forest	no	Old Growth - Mature Forest; Snags and Logs
	North Pacific Mountain Hemlock Forest	no	Old Growth - Mature Forest; Snags and Logs
	North Pacific Oak Woodland	yes	Old Growth - Mature Forest; Snags and Logs
	North Pacific Wooded Volcanic Flowage	no	
	Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	no	Old Growth - Mature Forest; Snags and Logs
	Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	no	Old Growth - Mature Forest; Snags and Logs
	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	yes	
	Northern Rocky Mountain Subalpine Woodland and Parkland	no	
	Northern Rocky Mountain Western Larch Savanna	yes	
	Rocky Mountain Aspen Forest and Woodland	yes	Aspen Stands
	Rocky Mountain Lodgepole Pine Forest	no	Old Growth - Mature Forest; Snags and Logs
	Rocky Mountain Poor-Site Lodgepole Pine Forest	no	Old Growth - Mature Forest; Snags and Logs
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	no	Old Growth - Mature Forest; Snags and Logs
	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	no	Old Growth - Mature Forest; Snags and Logs

Exhibit 5

PROJECT SCOPE

PROPOSED INSTALLATION OF A TELECOMMUNICATIONS FACILITY ON AN EXISTING PARCEL.

- 50.0' X 50.0' (2,500 SF) LEASE AREA
- 6.0' TALL CHAIN-LINK FENCE W/ GREEN PRIVACY SLATS & 12.0' WIDE DUAL SWING ACCESS GATE AROUND LEASE AREA
- (4) EQUIPMENT AREAS, (3) FOR FUTURE CARRIERS
- (1) UTILITY H-FRAME W/ (4) METER BASE CAPACITY
- (1) 150.0' MONOPOLE WITHIN FENCED LEASE AREA
- (1) ANTENNA MOUNTING ASSEMBLY, ANTENNAS, RADIOS, CABLES & GROUND SITE SUPPORT EQUIPMENT
- PROPOSED INSTALLATION OF A NEW 800A ELECTRICAL SERVICE

HARMONI TOWERS

MOSSYROCK

262 SKYVIEW DR
MOSSYROCK, WA 98564
HARMONI SITE #: WA0007224
CONSTRUCTION DRAWINGS

SHEET INDEX

PROJECT CONTACTS

APPLICANT:
ATTENTION: HARMONI TOWERS/
PARALLEL INFRASTRUCTURE
6210 ARDREY KELL RD, SUITE 450
CHARLOTTE, NC 28277-4864
CHAD RUMSEY
PH: 857.756.9022

PROPERTY OWNER:
KEVIN RIFFLE
PH: 425.445.4000

TOWER OWNER:
ATTENTION: HARMONI TOWERS/
PARALLEL INFRASTRUCTURE
6210 ARDREY KELL RD, SUITE 450
CHARLOTTE, NC 28277-4864
CHAD RUMSEY
PH: 857.756.9022

SITE ACQUISITION AGENT:
NORTH GROUP
P.O. BOX 2449
SNOHOMISH, WA 98291
BILL NORTH
PH: 425.876.2909

ZONING/PERMITTING AGENT:
NORTH GROUP
P.O. BOX 2449
SNOHOMISH, WA 98291
RACHEL NORTH
PH: 425.280.1376

SURVEYOR:
DUNCANSON
145 SW 155TH STREET, SUITE 102
SEATTLE, WA 98166
PH: 206.244.4141

ENGINEER OF RECORD:
VECTOR STRUCTURAL ENGINEERING
651 W. GALENA PARK BLVD., SUITE 101
DRAPER, UT 84020
WELLS L. HOLMES, SE
PH: 801.990.1775

PROJECT INFORMATION

SITE NAME:	MOSSYROCK	
ADDRESS:	262 SKYVIEW DR MOSSYROCK, WA 98564	
JURISDICTION:	LEWIS COUNTY	
PARCEL #:	028513011000	
ZONING:	RDD-5	
LATITUDE:	46° 32' 44.85" N	(46.545793°)
LONGITUDE:	122° 30' 16.60" W	(-122.504611°)
SOURCE:	1A CERTIFICATION	
GROUND ELEVATION:	1061.8'	
(N) STRUCTURE HEIGHT:	150.0' AGL	
(N) GROUND LEASE AREA:	2,500 SQ FT	
OCCUPANCY:	U	
GROUP:	II-B	

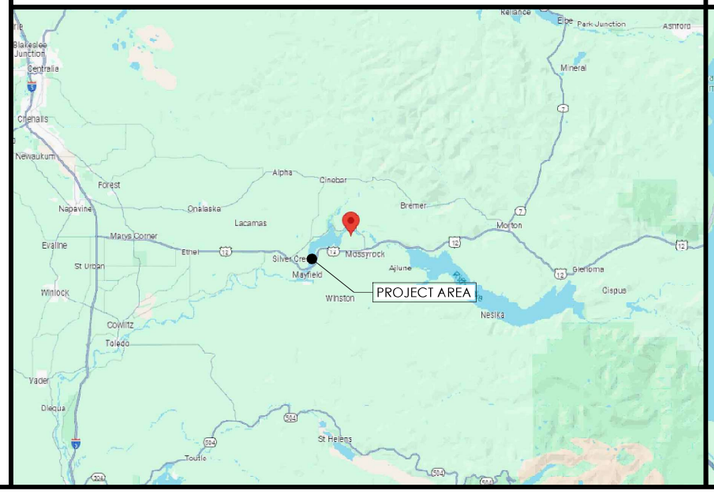
DRIVING DIRECTIONS

FROM VERIZON OFFICE IN PORTLAND, OREGON:

1. HEAD EAST TOWARD 158TH AVE SE
2. TURN RIGHT ONTO 158TH AVE SE
3. TURN RIGHT ONTO SE EASTGATE WAY
4. TURN LEFT ONTOI THE I-90 W RAMP TO SEATTLE
5. SLIGHT RIGHT ONTO THE 150TH AVE SE RAMP
6. TAKE THE RAMP ONTO I-90
7. MERGE ONTO I-90 W
8. USE THE RIGHT LANE TO MERGE ONTO I-5 S
9. TAKE EXIT 68 FOR US 12 E TOWARD MORTON/YAKIMA
10. TURN LEFT ONTO US-12 E
11. TURN LEFT ONTO BIRLEY RD
12. TURN RIGHT ONTO SKYVIEW DR
13. TURN LEFT TO STAY ON SKYVIEW DR

TOTAL MILES: 120 MILES

VICINITY MAP



LOCALIZED MAP

GOVERNING CODES

2021 INTERNATIONAL BUILDING CODE

2021 INTERNATIONAL MECHANICAL SPECIALITY CODE

2021 INTERNATIONAL FIRE CODE

2020 NFPA 70 NATIONAL ELECTRICAL CODE (NEC)

2021 WASHINGTON STATE ENERGY CODE

A.D.A. COMPLIANCE
INSTALLATION IS UNMANNED / NOT FOR HUMAN HABITATION. HANDICAP ACCESS IS NOT REQUIRED PER A.D.A.

811 Know what's **below.** **Call** before you dig.

HARMONI TOWERS

verizon

North GROUP

CAPITAL DESIGN SERVICES
1910 4TH AVE. E, PMB 196
OLYMPIA, WA 98506
360.915.6750
WWW.CAPITALDESIGNSERVICES.COM

DRAWN BY:	CL
CHECKED BY:	CL

DRAWING VERSION

VER.	DATE	DESCRIPTION
1	01/16/25	PRELIM CONST DRAWINGS

LICENSER

PROJECT INFORMATION

MOSSYROCK

262 SKYVIEW DR
MOSSYROCK, WA 98564

SHEET TITLE

TITLE SHEET

SHEET NO.

T1.0

PARENT PARCEL LEGAL DESCRIPTION

THAT PORTION OF SECTION 12, TOWNSHIP 12 NORTH, RANGE 2 EAST, W.M., LEWIS COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHWEST CORNER OF SAID SECTION 12; THENCE SOUTH 01°39'43" WEST 662.13 FEET ALONG THE WEST LINE OF SAID SECTION;
THENCE SOUTH 88°45'32" EAST 1578.6 FEET TO THE TRUE POINT OF BEGINNING;
THENCE CONTINUING SOUTH 88°45'32" EAST 451.03 FEET;
THENCE NORTH 01°53'43" EAST 483.02 FEET;
THENCE NORTH 88°45'31" WEST 452.33 FEET;
THENCE SOUTH 01°27'57" WEST 483 FEET TO THE TRUE POINT OF BEGINNING.

TOGETHER WITH AN EASEMENT OVER EXISTING GRAVEL ROADS LEADING FROM BIRLEY COUNTY ROAD TO AND THROUGH THE ABOVE DESCRIBED PROPERTY.

TITLE EXCEPTIONS:

DUNCANSON COMPANY HAS RECEIVED AND REVIEWED THE TITLE COMMITMENT PREPARED BY TITLE GUARANTY COMPANY (CHICAGO TITLE INSURANCE COMPANY) DATED EFFECTIVE MARCH 22, 2024, BEING COMMITMENT NO. 181300, FOR THE SUBJECT PROPERTY, TO DETERMINE THE IMPACTS OF EXISTING TITLE EXCEPTIONS.

SCHEDULE B, PART II

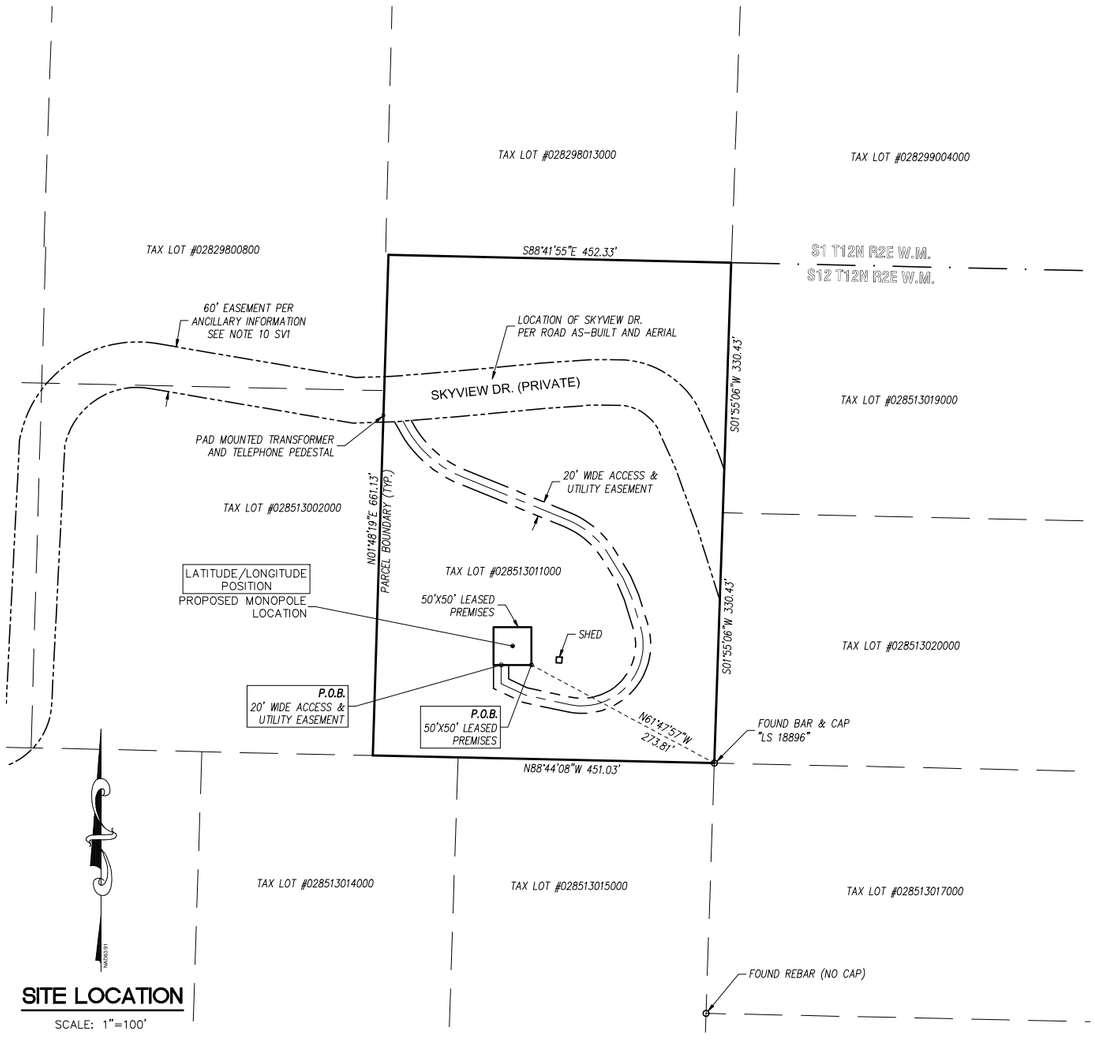
12. OBLIGATION OF MEMBERSHIP TO LAND OWNER'S ASSOCIATION AS DISCLOSED BY INSTRUMENT RECORDED JUNE 29, 1978 UNDER AUDITOR'S FILE NO. 848411 AND OTHER CONVEYANCE OF RECORD IN THE DEVELOPMENT. BLANKET IN NATURE, AFFECTS ENTIRE PARENT PARCEL, LEASE AREA AND ACCESS AND UTILITY EASEMENT.

13. MINERAL RESERVATIONS CONTAINED IN DEED
EXECUTED BY : WILLIAM B. LUDWIG AND JUANITA LUDWIG
RECORDED : SEPTEMBER 16, 1953
AUDITOR'S NO. : 523612.
THE COMPANY MAKES NO REPRESENTATION AS TO THE PRESENT OWNERSHIP OF ANY SUCH INTERESTS. THERE MAY BE LEASES, GRANTS, EXCEPTIONS OR RESERVATIONS OF INTERESTS THAT ARE NOT LISTED.

AFFECT ENTIRE PARENT PARCEL, LEASE AREA AND ACCESS AND UTILITY EASEMENT.

14. MINERAL RESERVATIONS CONTAINED IN DEED
EXECUTED BY : WILLIAM F. BOILEAU AND RUBY OPAL BOILEAU
RECORDED : MAY 15, 1961
AUDITOR'S NO. : 625083.
THE COMPANY MAKES NO REPRESENTATION AS TO THE PRESENT OWNERSHIP OF ANY SUCH INTERESTS. THERE MAY BE LEASES, GRANTS, EXCEPTIONS OR RESERVATIONS OF INTERESTS THAT ARE NOT LISTED.

AFFECTS ENTIRE PARENT PARCEL, LEASE AREA AND ACCESS AND UTILITY EASEMENT.



SITE LOCATION

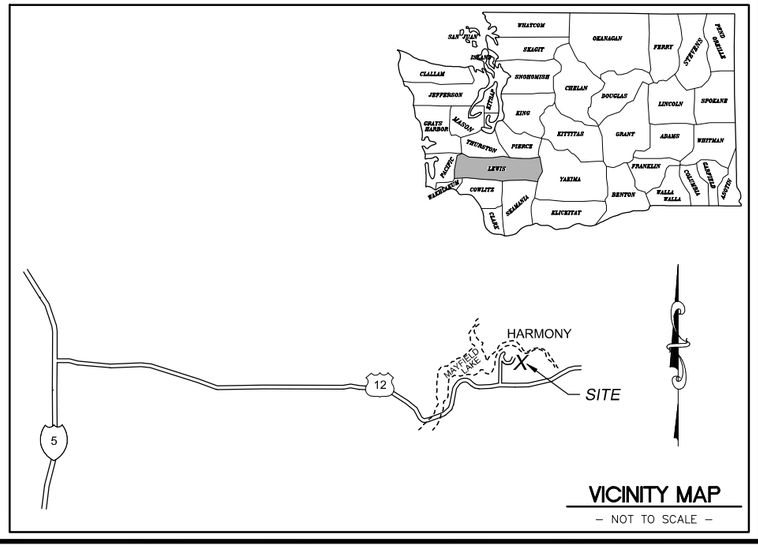
SCALE: 1"=100'

CERTIFICATION

TO: HARMONI TOWERS, LLC, A DELAWARE LIMITED LIABILITY COMPANY; ITS SUCCESSORS, ASSIGNS AND/OR DESIGNEES AND CHICAGO TITLE INSURANCE COMPANY:
I, KEVIN J. WALKER, AN OREGON PROFESSIONAL LAND SURVEYOR, CERTIFY THAT THE INFORMATION SHOWN HEREON WAS COMPILED USING DATA FROM AN ACTUAL FIELD SURVEY MADE UNDER MY DIRECT SUPERVISION AND THAT THE FIELD SURVEY AND THE COMPILATION OF INFORMATION SHOWN HEREIN WERE CONDUCTED IN ACCORDANCE WITH THE OREGON STATE REQUIREMENTS. THE FIELD WORK WAS COMPLETED ON SEPTEMBER 12. 2024.

KEVIN J. WALKER, PLS #41038

DATED: 10/29/24



VICINITY MAP

– NOT TO SCALE –

LATITUDE/LONGITUDE POSITION

COORDINATE DATA AT CENTER OF PROPOSED MONOPOLE LOCATION:
NAD 83/91
LAT – 46°32'44.85" N
LONG – 122°30'16.60" W

NAVD 88
ELEV.= 1061.8 FEET

LAT – 46.545793° N
LONG – 122.504611° W

BENCHMARK IS "SWWA" BASED ON WSRN PUGET SOUND REFERENCE NETWORK.

ELEVATION DERIVED USING GPS. ACCURACY MEETS OR EXCEEDS 1A STANDARDS AS DEFINED ON THE FAA ASAC INFORMATION SHEET 91-003.

NOTES

1) TITLE COMMITMENT ISSUED BY TITLE GUARANTY COMPANY (CHICAGO TITLE INSURANCE COMPANY), ORDER NO. 181300, DATED MARCH 22, 2024.
2) FEE OWNER: KEVIN RIFFLE AND JENNIFER RIFFLE.
3) DEED REC # 3518567
4) FIELD WORK CONDUCTED IN SEPTEMBER, 2024.
5) NO WETLANDS AREAS HAVE BEEN INVESTIGATED BY THIS SURVEY.
6) NO LANDSCAPE BUFFERS WERE INVESTIGATED BY THIS SURVEY.
7) BASIS OF BEARING: WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE (NAD83/91).
8) UNDERGROUND UTILITIES SHOWN HEREON, IF ANY, WERE DELINEATED FROM SURFACE EVIDENCE AND/OR UTILITY COMPANY RECORDS. CRITICAL LOCATIONS SHOULD BE VERIFIED PRIOR TO DESIGN AND CONSTRUCTION.
9) FEMA DESIGNATION: ZONE 'C' (AREAS OF MINIMAL FLOODING, (NO SHADING), FIRM MAP NUMBER 5301020500B, EFFECTIVE DATE DECEMBER 15, 1981.
10) EASEMENT STATEMENT AT END OF LEGAL DESCRIPTION GRANT ACCESS TO PARCEL FROM BIRLEY ROAD A PUBLIC RIGHT OF WAY, ALTHOUGH NO WIDTH IS GIVEN. OTHER RECORDS WEST OF PROPERTY STATE EASEMENT WIDTH OF 60 FEET WITH RECORDING NUMBERS 3287748, 3393809, 3208024, AND 3235454. THESE RECORDS ARE NOT INCLUDED IN OUR TITLE. EASEMENT SHOWN ON SV3 FROM THESE RECORDS, AERIAL, AND AS-BUILT INFORMATION.
11) THE LEASED PREMISES IS CONTIGUOUS ALONG IS COMMON BOUNDARIES TO THE ACCESS AND UTILITY EASEMENT, WHICH IN TURN IS CONTIGUOUS ALONG ITS COMMON BOUNDARIES TO THE PRIVATE ROAD EASEMENT FOR SKYVIEW DRIVE WHICH IN TURN IS CONTIGUOUS TO THE BIRLEY ROAD RIGHT OF WAY, AND THERE ARE NO GAPS, GORES, SPACES OR OVERLAPS BETWEEN OR AMONG ANY OF SAID PARCELS OF LAND.

LEGEND

- SUBJECT BOUNDARY LINE
- RIGHT-OF-WAY CENTERLINE
- RIGHT-OF-WAY LINE
- ADJACENT BOUNDARY LINE
- SECTIONAL BREAKDOWN LINE
- DP — OVERHEAD POWER LINE
- UP — BURIED POWER LINE
- G — BURIED GAS LINE
- OT — OVERHEAD TELEPHONE LINE
- UT — BURIED TELEPHONE LINE
- W — BURIED WATER LINE
- SS — BURIED SANITARY SEWER
- SD — BURIED STORM DRAIN
- DITCH LINE/FLOW LINE
- ROCK RETAINING WALL
- VEGETATION LINE
- CHAIN LINK FENCE
- WOOD FENCE
- BARBED WIRE/WIRE FENCE

△	TRANSFORMER		FIRE HYDRANT
☼	LIGHT STANDARD	⋈	GATE VALVE
P	POWER VAULT	⊞	WATER METER
⊠	UTILITY BOX		FIRE STAND PIPE
	UTILITY POLE	⊠	IRRIGATION CONTROL
‹---	GUY ANCHOR	□	CATCH BASIN, TYPE I
⊡	GAS VALVE	◎	CATCH BASIN, TYPE II
⊠	GAS METER		SIGN
T	TELEPHONE VAULT	∘	BOLLARD
Ⓣ	TEL. MANHOLE	▭	MAIL BOX
▫	TEL. PEDESTAL	234.21	SPOT ELEVATION

NOTE:
1) ALL ELEVATIONS SHOWN ARE ABOVE MEAN SEA LEVEL (AMSL) AND ARE REFERENCED TO THE NAVD88 DATUM.
2) ALL TOWER, TREE AND APPURTENANCE HEIGHTS ARE ABOVE GROUND LEVEL (AGL) AND ARE ACCURATE TO ± 0.5 FEET OR ± 1% OF TOTAL HEIGHT, WHICHEVER IS GREATER.

TREE LEGEND

DECIDUOUS TREE
AL12 — TRUNK DIAMETER (IN)
TYPE

EVERGREEN TREE
DF18 — TYPE
195.2 — HEIGHT AGL IF MEASURED
ST=STUMP

AL=ALDER
MP=MAPLE
DS=DECIDUOUS
MA=MADRONA
OK=OAK
CH=CHERRY

CE=CEDAR
DF=DOUGLAS FIR
HE=HEMLOCK
PI=PINE
EVG=EVERGREEN

NOTE:
TREE DRIP LINES ARE NOT TO SCALE. TREE SYMBOLS REFERENCE TRUNK LOCATION ONLY. TRUNK DIAMETERS WERE APPROXIMATED AT 3.5' TO 4' ABOVE GROUND LEVEL. TREES SHOWN ARE FOR REFERENCE ONLY AND OTHER TREES AND VEGETATION MAY EXIST.

SITE INFORMATION

TAX LOT NUMBER	028513011000
SITE ADDRESS	262 SKYVIEW DR MOSSYROCK, WA 98564
SITE CONTACT	KEVIN RIFFLE
PHONE NUMBER	425-445-4000
ZONING	RDD-5 (LEWIS COUNTY)
TOTAL LOT AREA	???± S.F.(??? AC.)
PROJECT AREA	2,500 S.F.

SURVEY REFERENCE

1. RECORD OF SURVEY PER A.F. NO. 3161844, RECORDS OF LEWIS COUNTY.
2. QUITCLAIM DEED PER A.F. NO. 3518567, RECORDS OF LEWIS COUNTY.

BOUNDARY DISCLAIMER

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UNDERGROUND UTILITIES EXIST IN THE AREA AND UTILITY INFORMATION SHOWN MAY BE INCOMPLETE. STATE LAW REQUIRES THAT CONTRACTOR CONTACT THE ONE-CALL UTILITY LOCATE SERVICE AT LEAST 48 HOURS BEFORE STARTING ANY CONSTRUCTION.

811 Know what's below. Call before you dig.

HARMONI TOWERS

CAPITAL DESIGN SERVICES

DUNCANSON
Company, Inc.
145 SW 155th Street, Suite 102
Seattle, Washington 98166
Phone 206.244.4141
Fax 206.244.4455

SITE
MOSSY ROCK
262 SKYVIEW DR.
MOSSYROCK, WA 98564
LEWIS COUNTY

FLD. CREW:	DC/AH
FLD. BOOK:	641/60
DRAWN BY:	LAC
JOB #:	99544.2970
DATE:	09/16/24

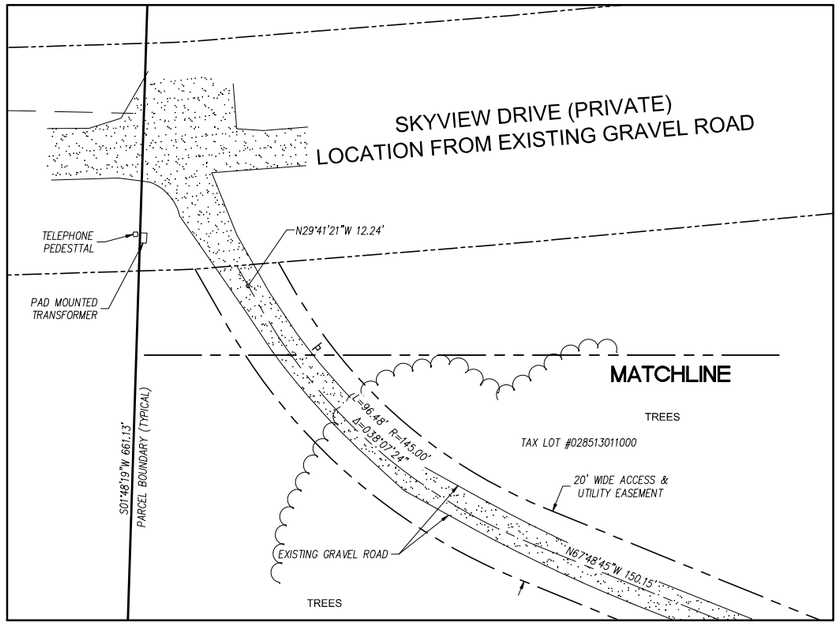
REVISIONS

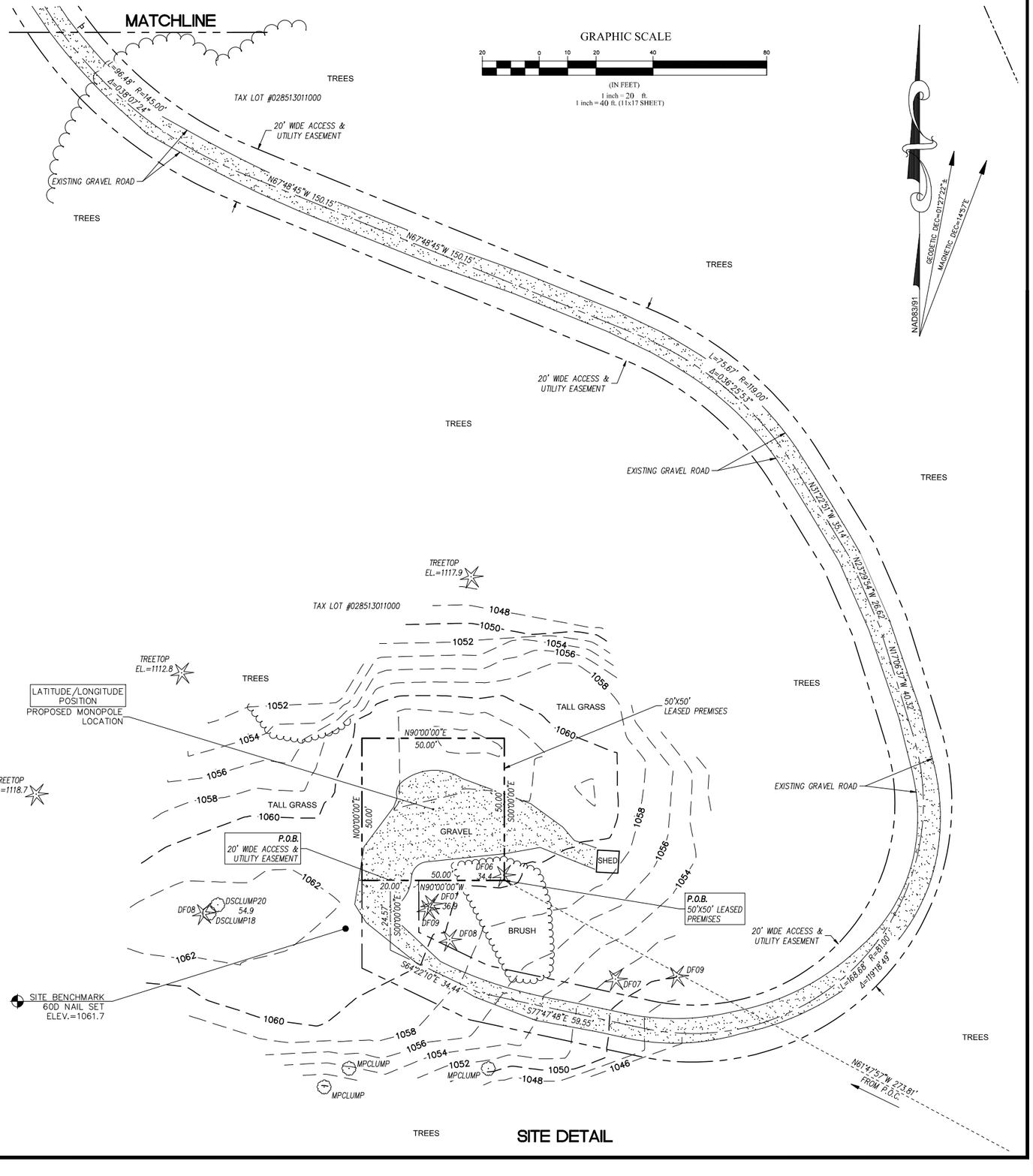
DATE	DESCRIPTION	BY
10/26/24	ADD TITLE INFORMATION	LAC

KEVIN J. WALKER — STATE OF WASHINGTON — 41038 — REGISTERED PROFESSIONAL LAND SURVEYOR
10/29/24

SHEET TITLE
SURVEY
SEC 12, TWP 21 N, RNG 2 E, WM

SHEET NUMBER
SV1





SITE DETAIL

LEGEND

- SUBJECT BOUNDARY LINE
- RIGHT-OF-WAY CENTERLINE
- RIGHT-OF-WAY LINE
- ADJACENT BOUNDARY LINE
- SECTIONAL BREAKDOWN LINE
- OP — OVERHEAD POWER LINE
- UP — BURIED POWER LINE
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- UT — BURIED TELEPHONE LINE
- W — BURIED WATER LINE
- SS — BURIED SANITARY SEWER
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- VEGETATION LINE
- CHAIN LINK FENCE
- WOOD FENCE
- BARBED WIRE/WIRE FENCE

TRANSFORMER	FIRE HYDRANT
LIGHT STANDARD	GATE VALVE
POWER VAULT	WATER METER
UTILITY BOX	FIRE STAND PIPE
UTILITY POLE	IRRIGATION CONTROL
GUY ANCHOR	CATCH BASIN, TYPE I
GAS VALVE	CATCH BASIN, TYPE II
GAS METER	SIGN
TELEPHONE VAULT	BOLLARD
TEL. MANHOLE	MAIL BOX
TEL. PEDESTAL	234.21 SPOT ELEVATION

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LONG – 122°30'16.60" W
NAVD 88
ELEV.= 1061.8 FEET

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DECIDUOUS TREE
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HARMONI TOWERS

CAPITAL DESIGN SERVICES

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SITE
MOSSY ROCK
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FLD. CREW:	DC/AH
FLD. BOOK:	641/60
DRAWN BY:	LAC
JOB #:	99544.2970
DATE:	09/16/24

REVISIONS

DATE	DESCRIPTION	BY
10/26/24	ADD TITLE INFORMATION	LAC

KEVIN J. WALKER STATE OF WASHINGTON 41038 REGISTERED PROFESSIONAL LAND SURVEYOR 10/29/24

SHEET TITLE
SURVEY
SEC 12, TWP 21 N, RNG 2 E, WM

SHEET NUMBER
SV2

LEASED PREMISES LEGAL DESCRIPTION

A TRACT OF LAND IN THE NORTHEAST QUARTER OF THE NORTHWEST QUARTER OF SECTION 12, TOWNSHIP 12 NORTH, RANGE 2 EAST, W.M., LEWIS COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

COMMENCING AT A FOUND BAR AND CAP STAMPED "LS #18896" AT THE NORTHEAST CORNER OF THE PROPERTY SURVEYED PER AUDITOR'S FILE NO. 3573008, RECORDS OF LEWIS COUNTY, WASHINGTON, FROM WHICH A FOUND REBAR BEARS SOUTH 01°55'06" WEST, 330.57 FEET;
THENCE NORTH 61°47'57" WEST, 273.81 FEET TO THE POINT OF BEGINNING;
THENCE NORTH 90°00'00" WEST, 50.00 FEET;
THENCE NORTH 00°00'00" EAST, 50.00 FEET;
THENCE SOUTH 90°00'00" EAST, 50.00 FEET;
THENCE SOUTH 00°00'00" WEST, 50.00 FEET TO THE POINT OF BEGINNING;

CONTAINING 2,500 S.F. OF LAND, MORE OR LESS.

ACCESS AND UTILITY EASEMENT LEGAL DESCRIPTION

A TRACT OF LAND IN THE NORTHEAST QUARTER OF THE NORTHWEST QUARTER OF SECTION 12, TOWNSHIP 12 NORTH, RANGE 2 EAST, W.M., LEWIS COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

SAID TRACT BEING A 20 FOOT WIDE STRIP OF LAND LYING 10 FEET ON BOTH SIDES OF THE FOLLOWING DESCRIBED CENTERLINE:

COMMENCING AT A FOUND BAR AND CAP STAMPED "LS #18896" AT THE NORTHEAST CORNER OF THE PROPERTY SURVEYED PER AUDITOR'S FILE NO. 3573008, RECORDS OF LEWIS COUNTY, WASHINGTON, FROM WHICH A FOUND REBAR BEARS SOUTH 01°55'06" WEST, 330.57 FEET;
THENCE NORTH 61°47'57" WEST, 273.81 FEET;
THENCE NORTH 90°00'00" WEST, 40.00 FEET TO THE POINT OF BEGINNING;
THENCE SOUTH 00°00'00" EAST, 24.57 FEET;
THENCE SOUTH 64°22'10" EAST, 34.44 FEET;
THENCE SOUTH 77°47'48" EAST, 59.55 FEET TO THE BEGINNING OF A CURVE TO THE LEFT HAVING A RADIUS OF 81.00 FEET;
THENCE ALONG SAID CURVE 168.68 FEET THROUGH A CENTRAL ANGLE OF 119°18'49";
THENCE NORTH 17°06'37" WEST, 40.32 FEET;
THENCE NORTH 23°29'54" WEST, 26.62 FEET;
THENCE NORTH 31°22'51" WEST, 35.14 FEET TO THE BEGINNING OF A CURVE TO THE LEFT HAVING A RADIUS OF 119.00 FEET;
THENCE ALONG SAID CURVE 75.67 FEET THROUGH A CENTRAL ANGLE OF 36°25'53";
THENCE NORTH 67°48'45" WEST, 150.15 FEET TO THE BEGINNING OF A CURVE TO THE RIGHT HAVING A RADIUS OF 145.00 FEET;
THENCE ALONG SAID CURVE 96.48 FEET THROUGH A CENTRAL ANGLE OF 38°07'24";
THENCE NORTH 29°41'21" WEST, 12.24 FEET TO THE SOUTH SIDE OF AN EXISTING EASEMENT FOR SKYVIEW DRIVE AND THE TERMINUS OF THIS CENTERLINE DESCRIPTION.

THE SIDELINES SHALL BE LENGTHENED OR SHORTENED TO INTERSECT WITH EACH OTHER AND TO TERMINATE AT THE SOUTH SIDE OF AN EXISTING EASEMENT FOR SKYVIEW DRIVE.

LEGEND

- SUBJECT BOUNDARY LINE
- RIGHT-OF-WAY CENTERLINE
- RIGHT-OF-WAY LINE
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TRANSFORMER	FIRE HYDRANT
LIGHT STANDARD	GATE VALVE
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TEL. PEDESTAL	234.21 SPOT ELEVATION

NOTE:
1) ALL ELEVATIONS SHOWN ARE ABOVE MEAN SEA LEVEL (AMSL) AND ARE REFERENCED TO THE NAVD88 DATUM.
2) ALL TOWER, TREE AND APPURTENANCE HEIGHTS ARE ABOVE GROUND LEVEL (AGL) AND ARE ACCURATE TO ± 0.5 FEET OR ± 1% OF TOTAL HEIGHT, WHICHEVER IS GREATER.

SURVEY REFERENCE

1. RECORD OF SURVEY PER A.F. NO. 3161844, RECORDS OF LEWIS COUNTY.
2. QUITCLAIM DEED PER A.F. NO. 3518567, RECORDS OF LEWIS COUNTY.

BOUNDARY DISCLAIMER

THIS PLAN DOES NOT REPRESENT A BOUNDARY SURVEY. SUBJECT AND ADJACENT PROPERTY LINES ARE DEPICTED USING FIELD-FOUND EVIDENCE AND RECORD INFORMATION.

UNDERGROUND UTILITIES EXIST IN THE AREA AND UTILITY INFORMATION SHOWN MAY BE INCOMPLETE. STATE LAW REQUIRES THAT CONTRACTOR CONTACT THE ONE-CALL UTILITY LOCATE SERVICE AT LEAST 48 HOURS BEFORE STARTING ANY CONSTRUCTION.

811 Know what's below. Call before you dig.

HARMONI TOWERS

CAPITAL DESIGN SERVICES

DUNCANSON
Company, Inc.
145 SW 155th Street, Suite 102
Seattle, Washington 98166
Phone 206.244.4141
Fax 206.244.4455

SITE
MOSSY ROCK
262 SKYVIEW DR.
MOSSYROCK, WA 98564
LEWIS COUNTY

FLD. CREW:	DC/AH
FLD. BOOK:	641/60
DRAWN BY:	LAC
JOB #:	99544.2970
DATE:	09/16/24

REVISIONS

DATE	DESCRIPTION	BY
10/26/24	ADD TITLE INFORMATION	LAC

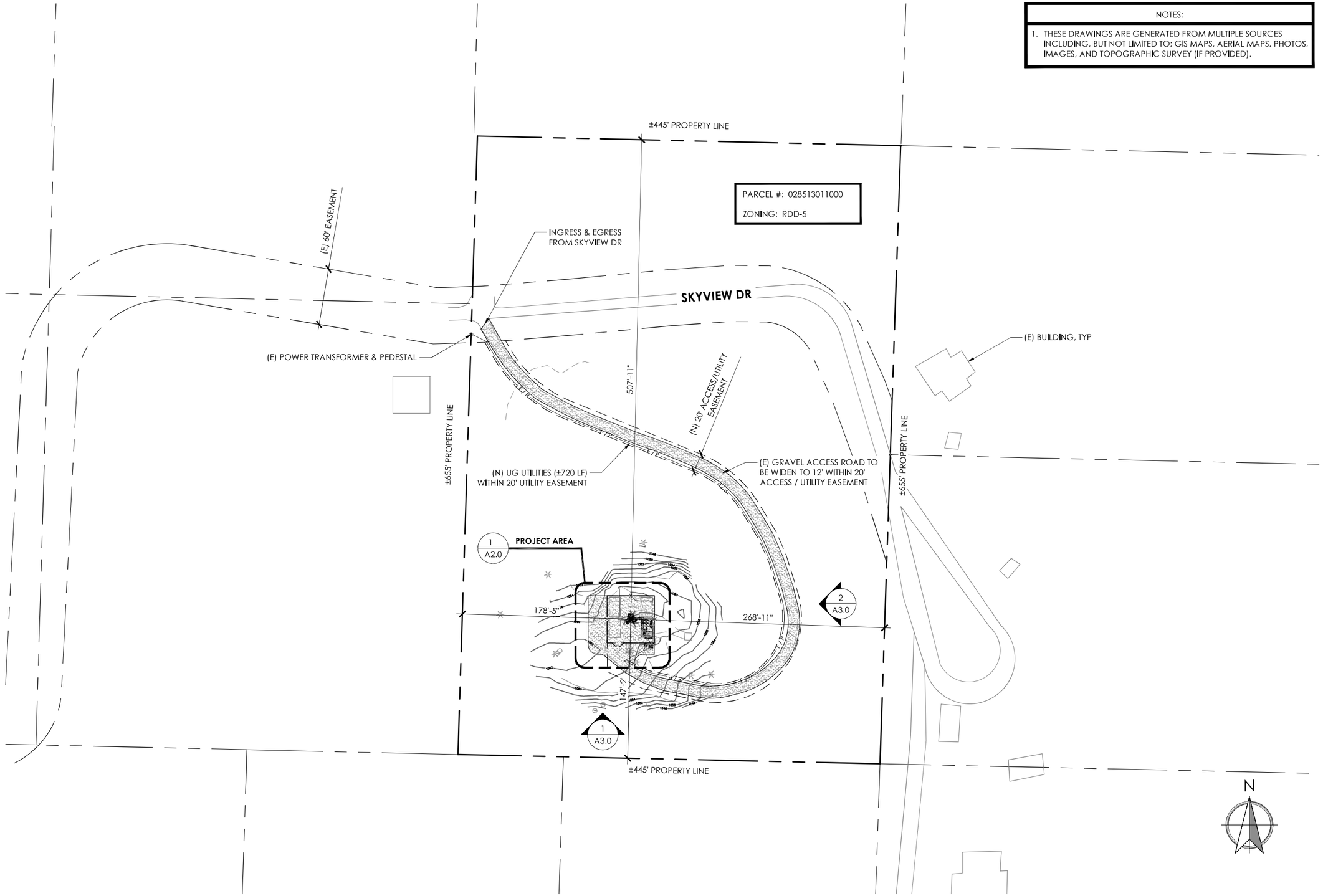
KEVIN J. WALKER — STATE OF WASHINGTON — 41038 — REGISTERED PROFESSIONAL LAND SURVEYOR
10/29/24

SHEET TITLE
SURVEY
SEC 12, TWP 21 N, RNG 2 E, WM

SHEET NUMBER
SV3

NOTES:

1. THESE DRAWINGS ARE GENERATED FROM MULTIPLE SOURCES INCLUDING, BUT NOT LIMITED TO; GIS MAPS, AERIAL MAPS, PHOTOS, IMAGES, AND TOPOGRAPHIC SURVEY (IF PROVIDED).



1 OVERALL SITE PLAN

11 X 17 SCALE: 1" = 100'-0"
22 X 34 SCALE: 1" = 50'-0"

0' 50' 100' 200'

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Olympia, WA 98506
360.915.6750
www.capitaldesignservices.com

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VER.	DATE	DESCRIPTION
1	01/16/25	PRELIM CONST DRAWINGS

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PROJECT INFORMATION

MOSSYROCK

262 SKYVIEW DR
MOSSYROCK, WA 98564

SHEET TITLE

OVERALL SITE PLAN

SHEET NO.

A1.0

1 ENLARGED EXISTING SITE PLAN

11 X 17 SCALE: 1" = 100'-0"

22 X 34 SCALE: 1" = 50'-0"

0' 50' 100' 200'

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PROJECT INFORMATION

MOSSYROCK

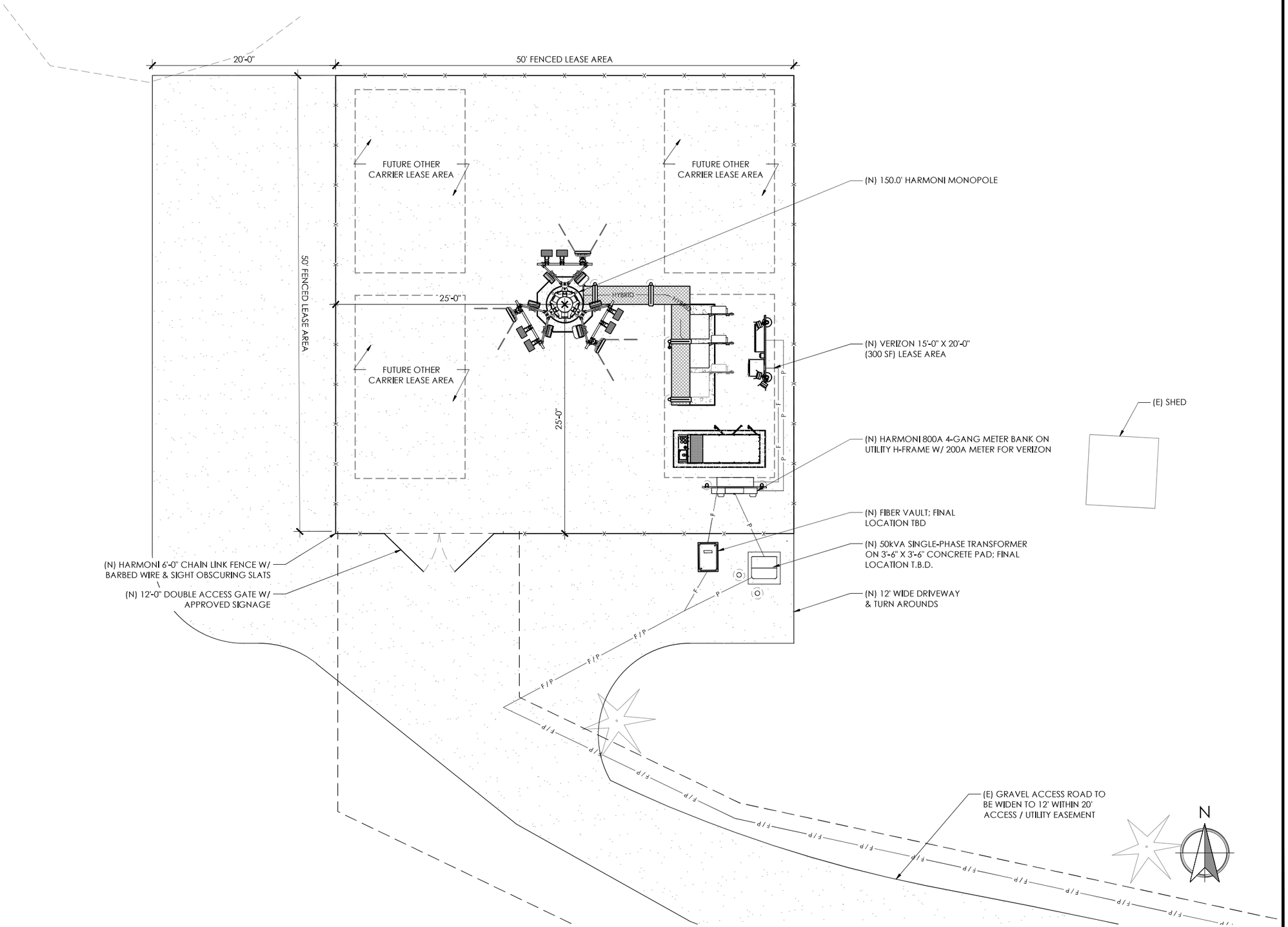
262 SKYVIEW DR
MOSSYROCK, WA 98564

SHEET TITLE

ENLARGED EXISTING SITE PLAN

SHEET NO.

A2.0



1 ENLARGED PROPOSED SITE PLAN

11 X 17 SCALE: 3/32" = 1'-0"
22 X 34 SCALE: 3/16" = 1'-0"

0' 10' 20'

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PROJECT INFORMATION

MOSSYROCK

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MOSSYROCK, WA 98564

SHEET TITLE

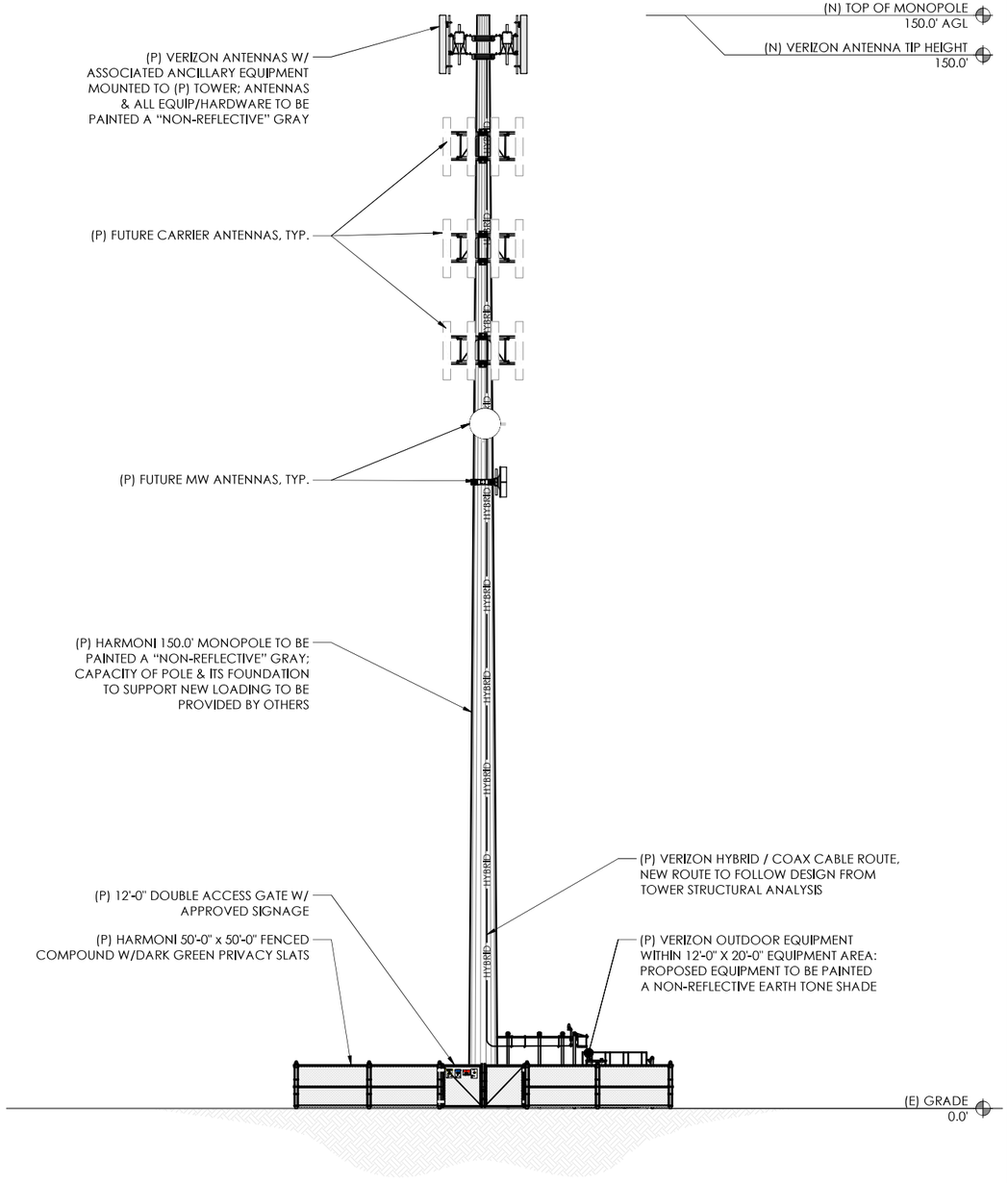
ENLARGED PROPOSED SITE PLAN

SHEET NO.

A2.1

NOTES:

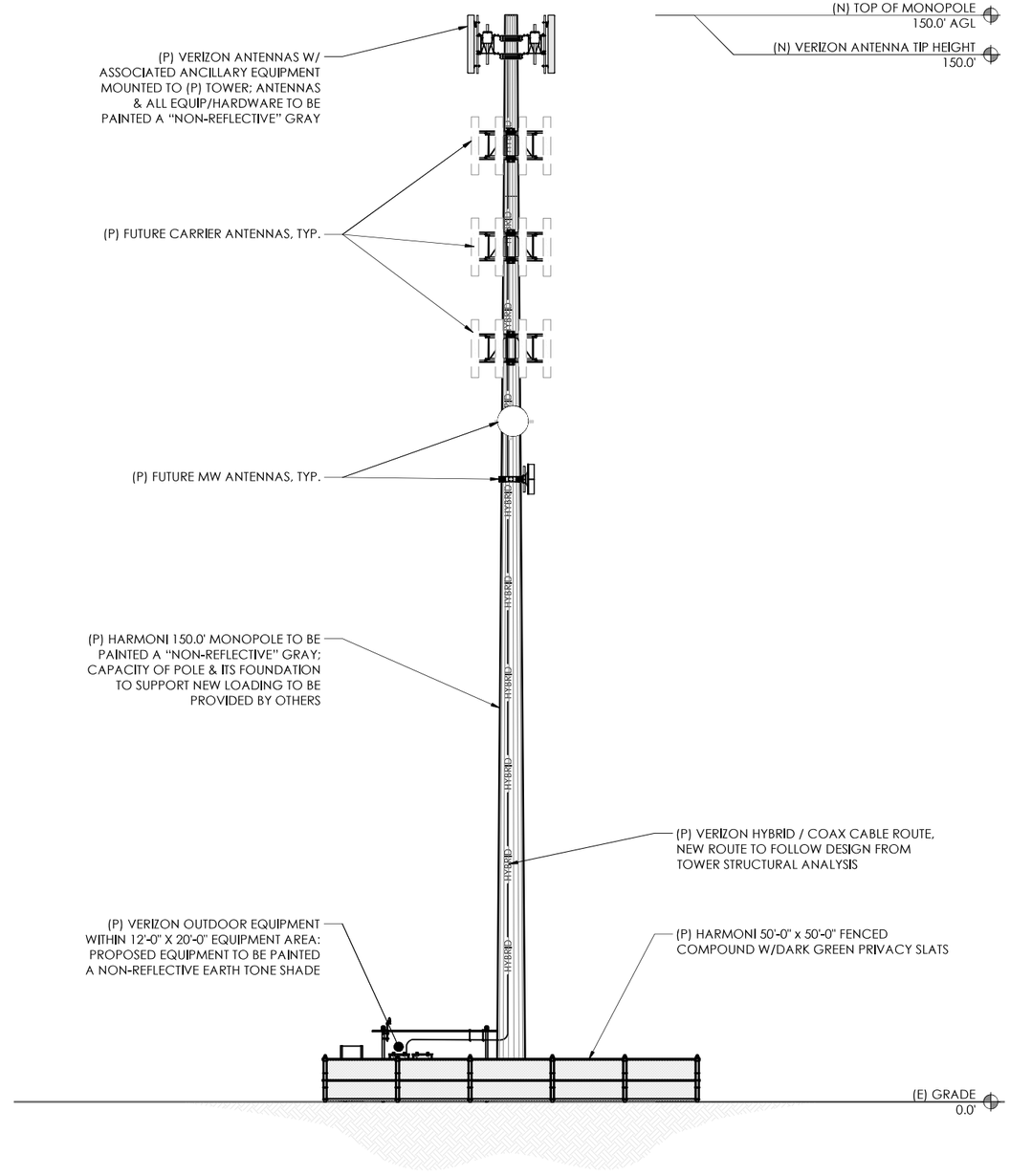
1. THE PROJECT CM / PM TO VERIFY ANY REQUIRED PAINTING REQUIREMENTS FOR PROPOSED TOWER, ANTENNAS, ANCILLARY EQUIPMENT, CABLES, AND HARDWARE PRIOR TO ORDERING / INSTALLING EQUIPMENT.
2. NEW OR REPLACEMENT ANTENNA MOUNTS SHALL COMPLY WITH NSTD-445 STANDARDS AS REQUIRED BY VERIZON.



1 SOUTH ELEVATION

11 X 17 SCALE: 1" = 20'-0"
22 X 34 SCALE: 1" = 10'-0"

0' 10' 20' 40'



2 EAST ELEVATION

11 X 17 SCALE: 1" = 20'-0"
22 X 34 SCALE: 1" = 10'-0"

0' 10' 20' 40'

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VER.	DATE	DESCRIPTION
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PROJECT INFORMATION

MOSSYROCK

262 SKYVIEW DR
MOSSYROCK, WA 98564

SHEET TITLE

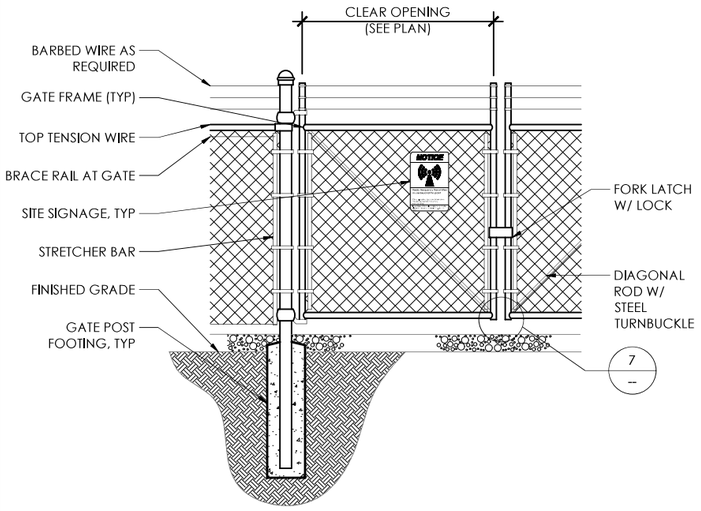
ELEVATIONS

SHEET NO.

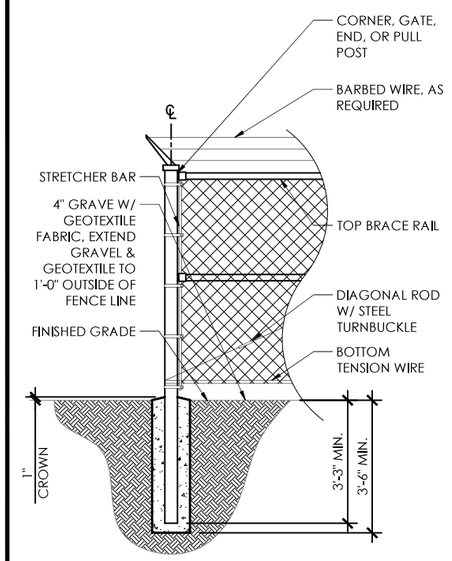
A3.0

1. THE CONTRACTOR SHALL MATCH THE FENCING STYLE, HEIGHT, BANDING, BARBED WIRES, SUPPORTS, AND MEASUREMENTS OF THE EXISTING FENCE WHEREVER THE PROJECT REQUIRES MODIFICATION OR EXTENSION OF AN EXISTING FENCED AREA.
2. ALL WIRE RAILS, FABRIC, POLES, HARDWARE, AND OTHER STEEL MATERIAL SHALL BE HOT-DIPPED GALVANIZED AND CONFORM TO ALL ASTM REGULATIONS FOR GALVANIZING.
3. THE FABRIC SHALL BE 6'-0" HIGH x 2" CHAIN LINK MESH OF NO. 9 GAUGE (0.148) WIRE, AND HAVE A TWISTED AND BARBED FINISH FOR THE TOP EDGES AND A KNUCKLED FINISH FOR THE BOTTOM EDGES. FABRIC SHALL CONFORM TO THE SPECIFICATIONS OF ASTM A-392 CLASS-1.
4. ALL BARBED WIRE SHALL BE 12 GAUGE TWISTED WIRE, DOUBLE-STRAND, WITH 14 GAUGE, 4 POINT ROUND BARBS SPACED AT 5" O.C..
5. ALL POSTS SHALL BE GALVANIZED STEEL, SCHEDULE 20 PIPE OF THE FOLLOWING DIAMETERS: LINE = 2-3/8" / CORNER = 3" / GATE = 3"
6. IF APPLICABLE, EXTEND CORNER AND GATE POSTS 12" INCLUDING THE METAL DOME CAP TO PROVIDE FOR ATTACHMENT OF THE BARBED WIRE.
7. GATE FRAMES SHALL HAVE A FULL HEIGHT VERTICAL BRACE AND A FULL WIDTH HORIZONTAL BRACE, SECURED IN PLACE BY USE OF GATE BRACE CLAMPS.
8. ALL TOP AND BRACED RAILS SHALL BE 1-5/8" Ø SCHEDULE 20 MECHANICAL BRACE, SECURED IN PLACE BY USE OF GATE BRACE CLAMPS.
9. HINGES SHALL BE A MINIMUM of 200 DEGREES WITH A HINGE ADAPTER. LATCHES, STOPS AND KEEPERS SHALL BE PROVIDED FOR ALL GATES. THE GUIDE LATCH ASSEMBLY SHALL BE TAMPER-PROOF. ALL STOPS AND DOUBLE GATES SHALL HAVE A FULL HEIGHT PLUNGER BAR WITH A METAL DOME CAP.
10. A NO. 7 GAUGE ZINC COATED TENSION WIRE IS TO BE USED AT THE BOTTOM OF THE FABRIC, TERMINATED WITH BAND CLIPS AT CORNER AND GATEPOSTS.
11. A 6" x 12" EYEBOLT TO HOLD TENSION WIRE SHALL BE USED AT AL LINE POSTS.
12. ALL STRETCHER BARS SHALL BE 3/16 x 3/4" OR HAVE EQUIVALENT CROSS SECTION AREA.
13. ALL CORNER GATE AND END PANELS SHALL HAVE A 3/8" TRUSS ROD WITH TURNBUCKLES AND BE BRACED WITH ONE 1-5/8" HORIZONTAL COMPRESSION MEMBER, SECURELY ATTACHED WITH IRON FITTINGS.
14. CONTRACTOR TO PROVIDE ALL OTHER HARDWARE NECESSARY TO ATTACH, TENSION, CLIP, BAND, HINGE, FASTEN AND FINISH THE FENCING PROPERLY.
15. IF APPLICABLE, THE BARBED WIRE SUPPORT ARMS SHALL BE SCH. 40, GALVANIZED STEEL WITH SET BOLT AND LOCK LOCK WIRE IN THE ARM.
16. ALL POSTS, GATE GUARDS, AND OTHER OPEN PIPES SHALL BE CAPPED WITH A HOT DIPPED GALVANIZED CAST STEEL DOME CAP.
17. ALL POSTS SHALL HAVE A MINIMUM OF 6" OF CONCRETE UNDER THE LOWER MOST PORTION TO A MINIMUM OF 8" LARGER THAN THE DIAMETER AT THE FINISHED GRADE.
18. ALL FENCE POSTS SHALL BE SCH. 40 GALVANIZED STEEL POSTS WITH SET BOLT AND LOCK WIRE IN THE ARM.
19. AT CORNER POSTS, GATE POST, LINE POST, AND SIDE OF GATE FRAME, FABRIC SHALL BE ATTACHED WITH STRETCHER AND TENSION BAND CLIPS AT 1'-3" INTERVALS.
20. ATTACH FABRIC TO BRACE RAILS, TENSION WIRE AND TRUSS RODS WITH THE TIE CLIPS AT 2'-0" INTERVALS.
21. PROVIDE A MAXIMUM GAP OF 1" BETWEEN THE CHAIN LINK FABRIC AND THE FINAL GRADE.
22. GATE HINGES SHALL HAVE THEIR THREADS PEENED OR WELDED TO PREVENT UNAUTHORIZED REMOVAL, AND GATES SHALL BE INSTALLED SO THAT LOCKS ARE ACCESSIBLE FROM BOTH SIDES.
23. CONTRACTOR TO TOUCH UP ALL SCRAPES, SCRATCHES, MARKS, AND BARE AREAS WITH A COLD GALVANIZED SPRAY.

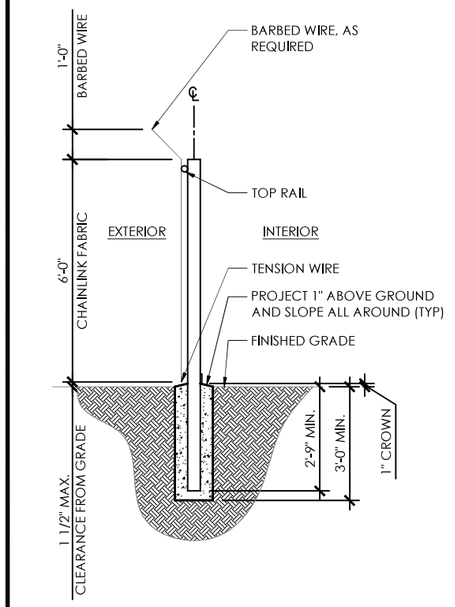
1 NOTES



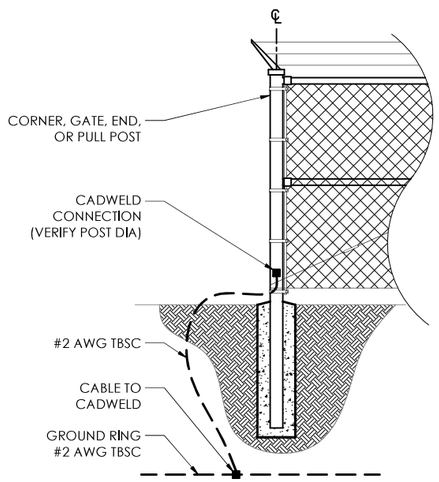
2 DOUBLE SWING GATE — 11x17 SCALE: NTS / 22x34 SCALE: NTS

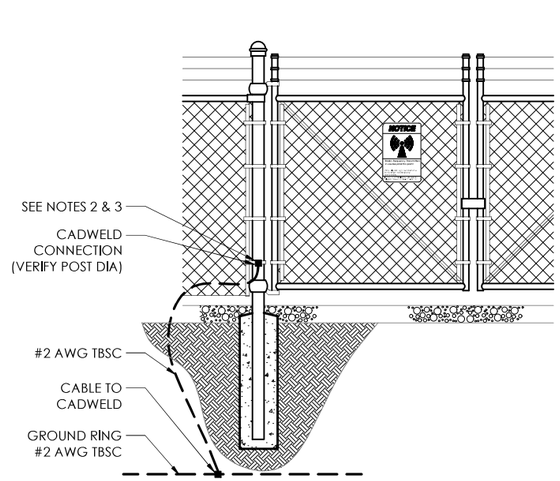


3 CORNER POST — 11x17 SCALE: NTS / 22x34 SCALE: NTS



4 WOVEN WIRE — 11x17 SCALE: NTS / 22x34 SCALE: NTS

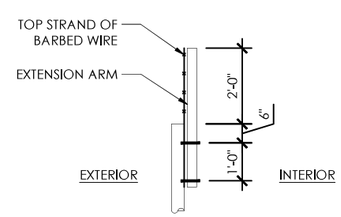




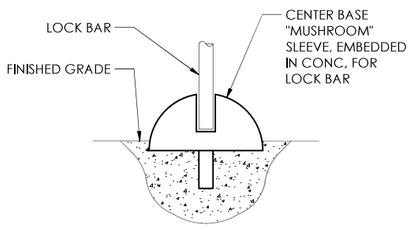
GROUNDING NOTES:

1. VERTICAL POSTS SHALL BE BONDED TO THE RING AT EACH CORNER AND AT EACH GATE POST. AT MINIMUM, ONE VERTICAL POST SHALL BE BONDED TO THE GROUND RING IN EVERY 100-FOOT STRAIGHT RUN OF FENCE.
2. HE #2 AWG, TBSC, FROM THE RING GROUND SHALL BE CADWELDED TO THE POST, ABOVE GROUND.
3. THE GATE JUMPER SHALL BE #4/0 AWG WELDING CABLE OR FLEXIBLE COPPER BRAIDED FLAT STRAP WITH SLEEVES ON EACH END DESIGNED FOR EXOTHERMIC WELDING.
4. THE GATE JUMPER SHALL BE INSTALLED SO THAT IT WILL NOT BE SUBJECTED TO DAMAGING STRAIN WHEN GATE IS FULL OPEN IN EITHER DIRECTIONS.

5 FENCE GROUNDING — 11x17 SCALE: NTS / 22x34 SCALE: NTS



6 BARBED WIRE — 11x17 SCALE: NTS / 22x34 SCALE: NTS



7 GATE STOP — 11x17 SCALE: NTS / 22x34 SCALE: NTS

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PROJECT INFORMATION

MOSSYROCK

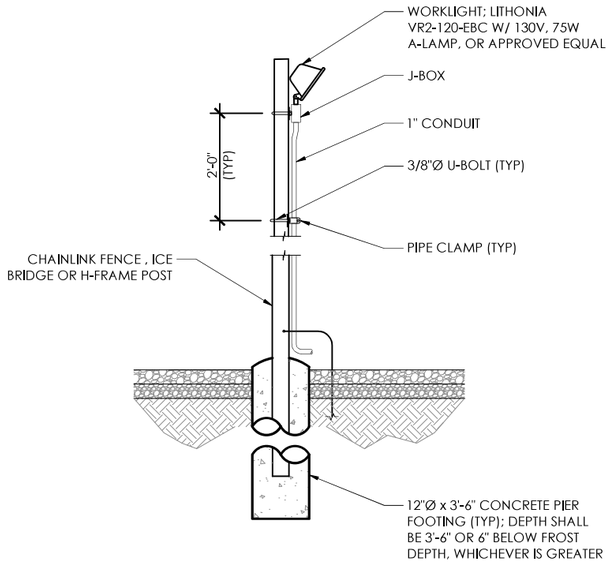
262 SKYVIEW DR
MOSSYROCK, WA 98564

SHEET TITLE

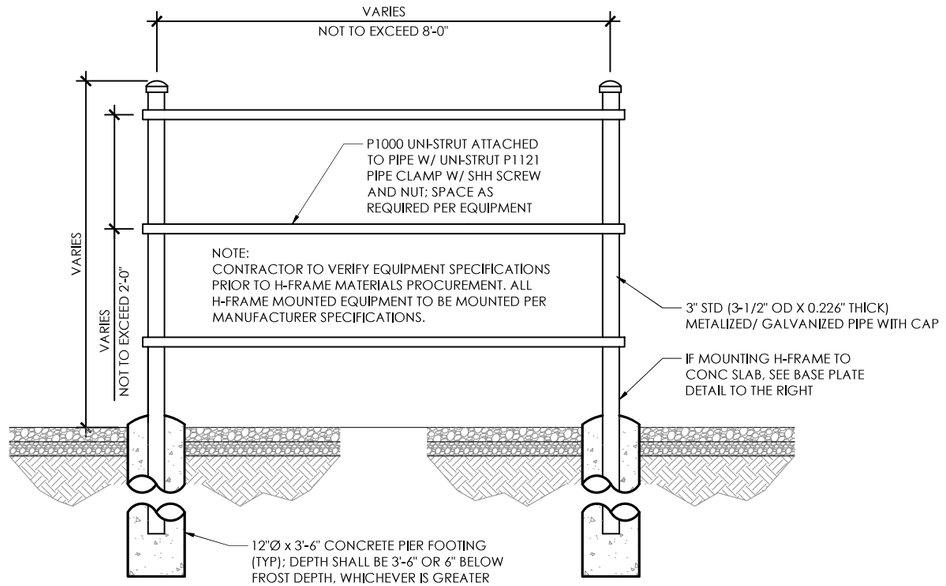
FENCE DETAILS

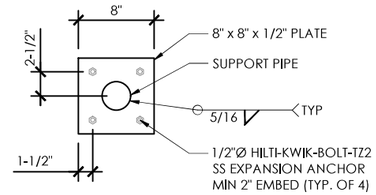
SHEET NO.

A4.0



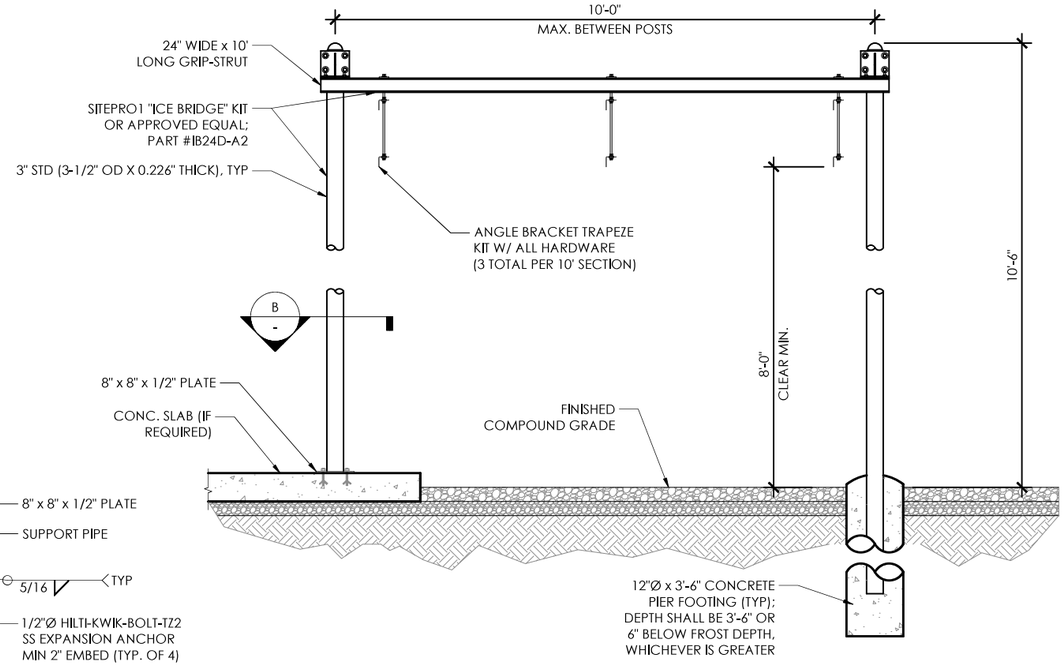
1 WORK LIGHT — 11X17 SCALE: NTS; 22 x 34 SCALE: NTS

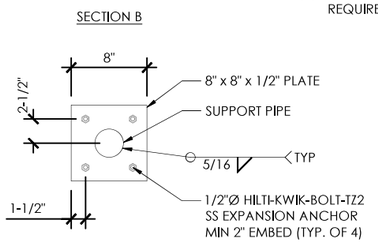




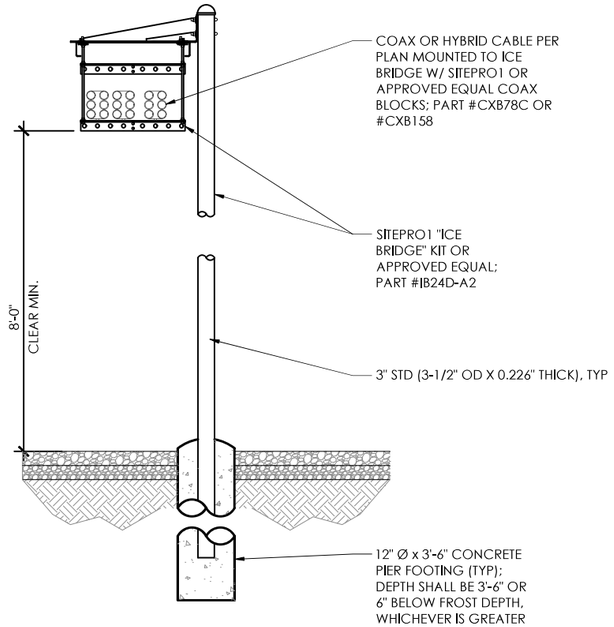
BASE PLATE -
OPTIONAL PIPE TO
CONC ATTACHMENT

2 H-FRAME — 11X17 SCALE: NTS; 22 x 34 SCALE: NTS





3 CABLE BRIDGE — 11x17 SCALE: NTS; 22x34 SCALE: NTS



4 CABLE BRIDGE SECTION — 11x17 SCALE: NTS; 22x34 SCALE: NTS

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PROJECT INFORMATION

MOSSYROCK

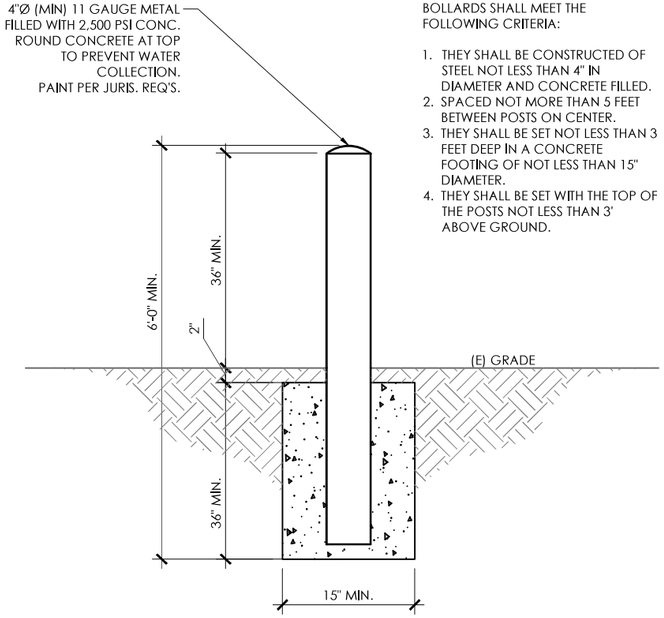
262 SKYVIEW DR
MOSSYROCK, WA 98564

SHEET TITLE

CONSTRUCTION DETAILS

SHEET NO.

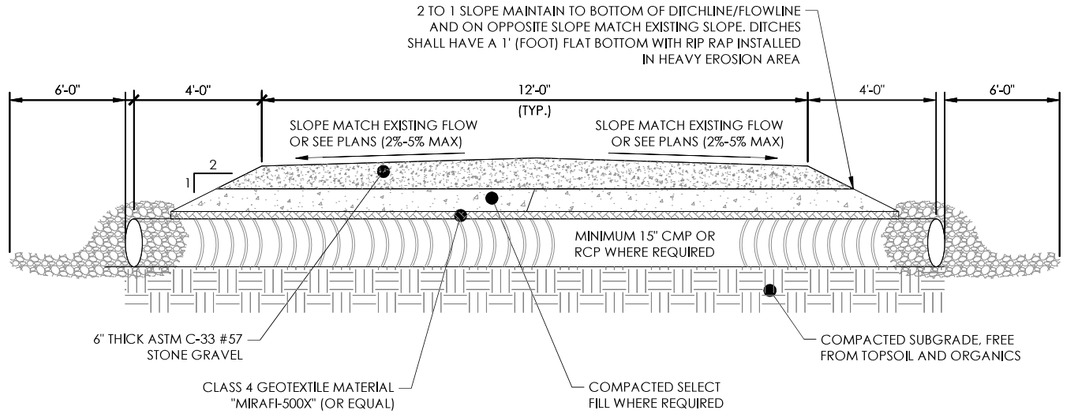
A5.0



BOLLARDS SHALL MEET THE FOLLOWING CRITERIA:

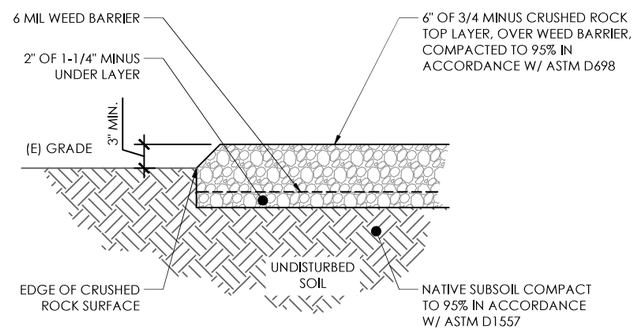
1. THEY SHALL BE CONSTRUCTED OF STEEL NOT LESS THAN 4" IN DIAMETER AND CONCRETE FILLED.
2. SPACED NOT MORE THAN 5 FEET BETWEEN POSTS ON CENTER.
3. THEY SHALL BE SET NOT LESS THAN 3 FEET DEEP IN A CONCRETE FOOTING OF NOT LESS THAN 15" DIAMETER.
4. THEY SHALL BE SET WITH THE TOP OF THE POSTS NOT LESS THAN 3' ABOVE GROUND.

1 BOLLARD DETAIL — 11X17 SCALE: NTS; 22 x 34 SCALE: NTS



NOTES:
1. USE OF SWALES AND/OR DRAINAGE DITCHES FOR PROPER WATER RUNOFF AS NEEDED.
2. AGGREGATE IS BASED ON STANDARD AASHTO.
3. 2" CROWN IN CENTER OF ACCESS, UNLESS IN CURVES, THEN ACCESS SHOULD BE SLOPED TO INSIDE OF TURN / CURVE
4. PIPE SHALL BE AT A MINIMUM OF 4' LONGER THEN ACCESS ROAD WIDTH ON EACH SIDE FOR PROPER SHOULDERING.
5. ALL CROSSDRAINS SHALL BE INSTALLED ON A 45° ANGLE WITH THE FALL OF THE GRADE.

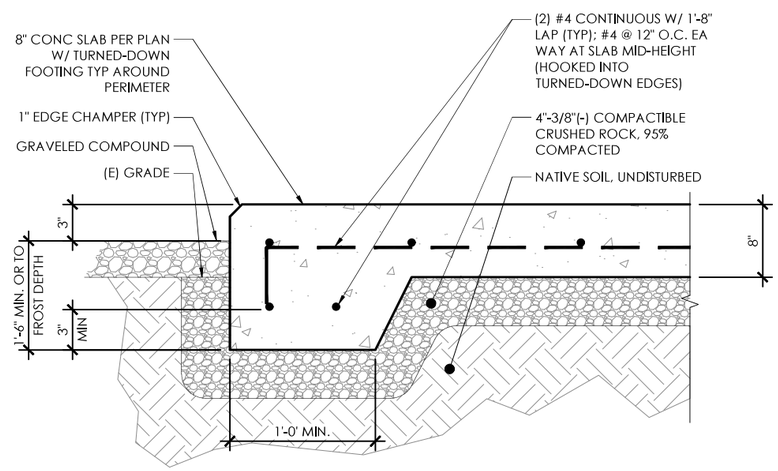
2 ACCESS ROAD SECTION VIEW DETAIL — 11X17 SCALE: NTS; 22 x 34 SCALE: NTS



NOTES:
1. CONTRACTOR SHALL STRIP SUPERFICIAL, SOFT, WET, ORGANIC OR DELETERIOUS SOILS TO EXPOSE FIRM AND UNYIELDING SOIL.
2. IF STRIPPING IS REQUIRED DEEPER THAN 6", CONTRACTOR SHALL CONTACT THE SITE CONSTRUCTION MANAGER TO DETERMINE THE APPROPRIATE STRIPPING DEPTH AT THE TIME OF CONSTRUCTION.

3 COMPOUND SECTION DETAIL — 11X17 SCALE: NTS; 22 x 34 SCALE: NTS

NOTES:
1. SEE STRUCTURAL CONCRETE NOTES, SHEET GN2.0.
2. SLOPE CONCRETE 1/4" PER FOOT MININUM.
2. VERIFY EQUIPMENT CABINET SPECIFICATIONS FOR MOUNTING HOLE LOCATIONS.
3. MINIMUM OF 2" COVER AT TOP OF SLAB, AND 3" WHERE CONCRETE IS IN CONTACT W/ SOIL.
4. SOIL SHALL BE PREPARED WITH A FLAT SURFACE, FREE AND CLEAR OF STANDING WATER AND LOOSE DEBRIS. SOIL SHOULD BE WELL COMPACTED TO 90% OF IT MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT.
5. TOP SURFACE OF SLAB SHALL BE A LIGHT BROOM FINISH AND TAPERED TO ALLOW WATER TO SHED WITHOUT PONDING.



4 TYPICAL CONCRETE PAD SECTION — 11X17 SCALE: NTS; 22 x 34 SCALE: NTS

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PROJECT INFORMATION

MOSSYROCK

262 SKYVIEW DR
MOSSYROCK, WA 98564

SHEET TITLE

CONSTRUCTION DETAILS

SHEET NO.

A5.1

1 RFE GUIDELINE SIGNAGE — 11X17 SCALE: NTS; 22 x 34 SCALE: NTS

HARMONI TOWERS

ASR NUMBER:

SITE NAME: MOSSYROCK

SITE ID: WA0007224

FOR LEASING INFORMATION CALL:
501.850.0820

IN CASE OF EMERGENCY CALL:
844.398.9716

2 HARMONI SITE ID SIGNAGE — 11X17 SCALE: NTS; 22 x 34 SCALE: NTS

3 NOT USED — 11X17 SCALE: NTS; 22 x 34 SCALE: NTS

4 NOT USED — 11X17 SCALE: NTS; 22 x 34 SCALE: NTS

5 NOT USED — 11X17 SCALE: NTS; 22 x 34 SCALE: NTS

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MOSSYROCK

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MOSSYROCK, WA 98564

SHEET TITLE

SITE SIGNAGE DETAILS

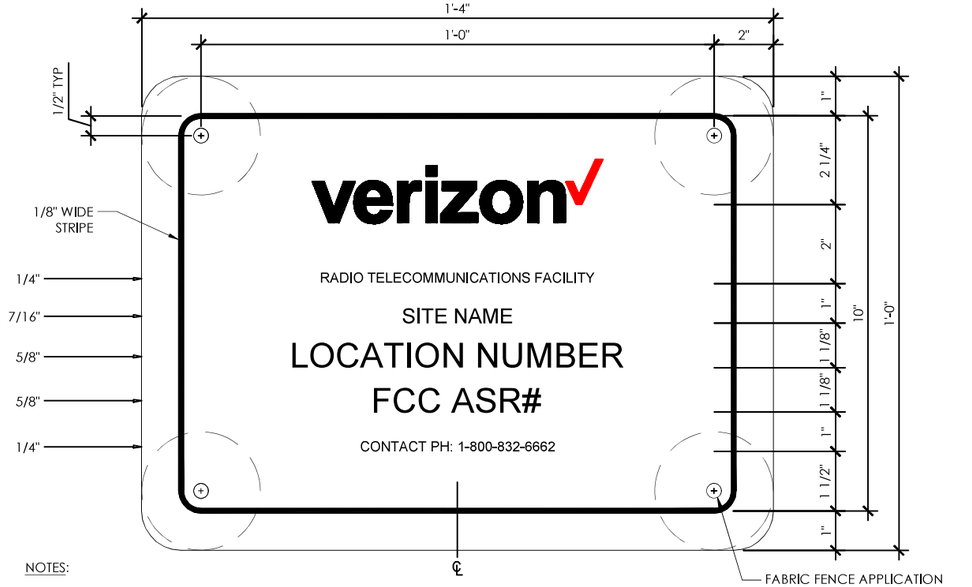
SHEET NO.

A6.0

SIGNS AND PLACEMENT:

1. LOW LEVEL (BLUE) WARNING SIGNS (PLACE AT SITE ENTRY/ACCESS POINTS ONLY):
   - ROOF TOPS: PLACE SIGNS ON THE INSIDE OF ROOF HATCH. PLACE ON ACCESS DOOR UNLESS DOOR IS USED BY GENERAL PUBLIC OR BUILDING TENANTS REGULARLY FOR ACCESS. IN THESE CASES, CONSULT CONSTRUCTION MANAGER OR QC SUPERVISOR.
   - WATER TANKS: PLACE SIGNS ON COMPOUND GATE.
   - VERIZON -OWNED SITES: PLACE ONE SIGN ON SITE GATE.
2. HIGH LEVEL (RED) CAUTION SIGNS (PLACE AT ALL ANTENNA SECTORS WHERE ACCESS BY THE GENERAL PUBLIC TO THE ANTENNAS IS POSSIBLE:
   - ALL SIGNS WILL BE SECURED WITH EITHER STAINLESS STEEL ZIP TIES OR STAINLESS TECH SCREWS.
3. CC PARTICIPATION IN SIGN LOCATION:
   - CM WILL MEET WITH ALL CC'S TO OUTLINE CRITERIA FOR SIGN PLACEMENT, EMPHASIS WILL BE ON 'GRAY AREA' SITES. WHERE SIGN PLACEMENT IS PARTICULARLY CHALLENGING. WE WILL GIVE CC'S AS MUCH GUIDANCE ON SPECIFIC SITUATIONS AS WE CAN FORESEE, BUT CC'S WILL BE ENCOURAGED TO PARTNER WITH CM OR QC IN DECIDING PLACEMENT OF DIFFICULT SITES. A JOINT SITE VISIT MAY BE REQUIRED TO FULFILL REQUIREMENTS.
   - CC WILL CALL OUT SIGN LOCATION(S) AT THE A&E WALK FOR EACH SITE AS THOSE OCCUR.
   - ON SITES WITH EXISTING A&E BUT NOT YET CONSTRUCTED, CC WILL BE ASKED TO PROVIDE (WITHIN A REASONABLE TIME FRAME TBD) A DETAIL FOR SIGN PLACEMENT THAT WILL BE SLIP-SHEETED INTO EXISTING SETS.
4. SIGN DISBURSEMENT FROM WAREHOUSE:
   - SIGNS WILL BE IN STOCK AT KENT WAREHOUSE TO BE DISBURSED AS PART OF THE GC BOM AS CALLED OUT IN A&E DRAWINGS FOR EACH SITE.

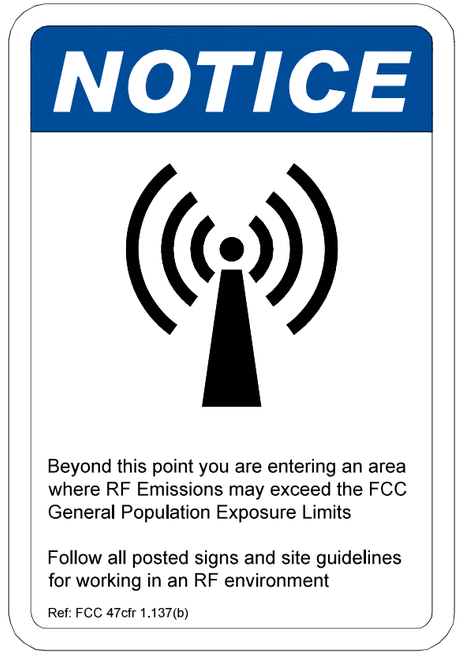
1 NOTES



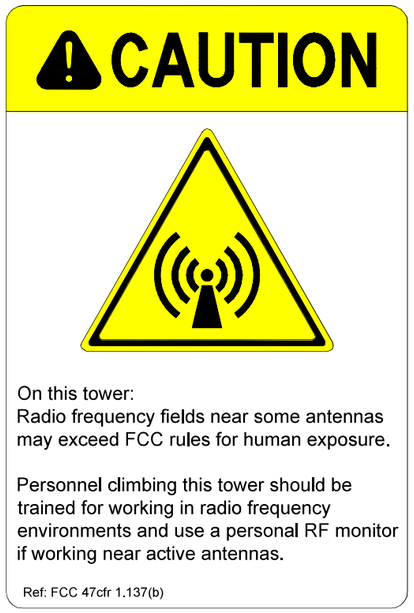
NOTES:

1. FOR VERIZON LOGO SEE VERIZON DESIGN SPECIFICATIONS (PROVIDED BY VERIZON)
2. ALL TEXT FONT IS ARIAL U.N.O.
3. CONTRACTOR TO PROCURE FCC NO. FROM COMPLIANCE COORDINATOR PH: (425) 895-7000
4. TEXT FOR SIGNAGE SHALL INDICATE CORRECT SITE NAME AND NUMBER AS PER VERIZON CONSTRUCTION MANAGER RECOMMENDATIONS.
5. CABINET / SHELTER MOUNTING APPLICATION REQUIRES ANOTHER PLATE APPLIED TO THE FACE OF THE CABINET WITH WATER PROOF POLYURETHANE ADHESIVE.

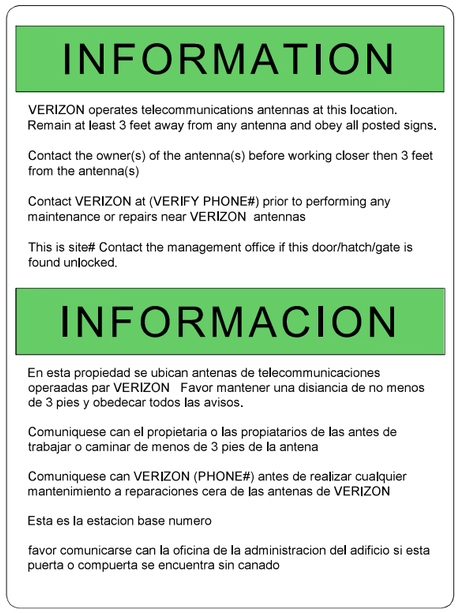
2 VERIZON SITE SIGNAGE — 11x17 SCALE: NTS — 22x34 SCALE: NTS



3 RF WARNING SIGN — 11x17 SCALE: NTS — 22x34 SCALE: NTS

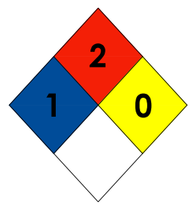


4 RF WARNING SIGN — 11x17 SCALE: NTS — 22x34 SCALE: NTS



5 INFORMATION SIGN — 11x17 SCALE: NTS — 22x34 SCALE: NTS

NFPA 704 HAZARD IDENTIFICATION SYSTEM
15" DIAMOND



HAZARD RATINGS:

NINE O'CLOCK:	HEALTH
TWELVE O'CLOCK:	FLAMMABILITY
THREE O'CLOCK:	INSTABILITY
SIX O'CLOCK:	SPECIAL

REFERENCES:

NFPA 704
UFC 7901.9
IFC 2703.5

6 FUEL STORAGE SIGN — 11x17 SCALE: NTS — 22x34 SCALE: NTS

7 NO TRESPASSING SIGN — 11x17 SCALE: NTS — 22x34 SCALE: NTS

HARMONI TOWERS

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DRAWN BY:	CL
CHECKED BY:	CL

DRAWING VERSION

VER.	DATE	DESCRIPTION
1	01/16/25	PRELIM CONST DRAWINGS

LICENSER

PROJECT INFORMATION

MOSSYROCK

262 SKYVIEW DR
MOSSYROCK, WA 98564

SHEET TITLE

SITE SIGNAGE DETAILS

SHEET NO.

A6.1

GENERAL CONSTRUCTION NOTES

1. ALL WORK SHALL ADHERE TO THE REQUIREMENTS OF THE LOCAL BUILDING CODE (LATEST EDITION), AND ALL OTHER APPLICABLE CODES AND ORDINANCES AS REQUIRED BY THE JURISDICTION.
2. CONTRACTOR SHALL CONSTRUCT SITE IN ACCORDANCE WITH THESE DRAWINGS AND THE CARRIER INTEGRATED CONSTRUCTION STANDARDS FOR WIRELESS SITES (LATEST REVISION). SPECIFICATIONS ARE THE RULING DOCUMENTS, AND ANY DISCREPANCIES BETWEEN THE SPECIFICATIONS AND THESE DRAWINGS SHOULD BE BROUGHT TO THE ATTENTION OF THE ENGINEER OF RECORD (EOR) PRIOR TO PROCEEDING WITH CONSTRUCTION.
3. THE DRAWINGS ARE NOT TO BE SCALED. THESE PLANS ARE INTENDED TO BE A DIAGRAMMATIC OUTLINE ONLY, UNLESS OTHERWISE NOTED. THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT AND APPURTENANCES, AND LABOR NECESSARY TO EFFECT ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.
4. CONTRACTOR SHALL VISIT THE JOB SITE AND SHALL FAMILIARIZE HIMSELF WITH ALL CONDITIONS AFFECTING THE PROPOSED WORK AND SHALL MAKE PROVISIONS AS TO THE COST THEREOF. FIELD CONDITIONS INCLUDING DIMENSIONS, AND CONFIRMING THAT THE WORK MAY BE ACCOMPLISHED AS SHOWN IN THE DRAWINGS PRIOR TO PROCEEDING WITH CONSTRUCTION, IS REQUIRED. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE EOR PRIOR TO THE COMMENCEMENT OF WORK. NO COMPENSATION WILL BE AWARDED BASED ON CLAIM OF LACK OF KNOWLEDGE OF FIELD CONDITIONS.
5. DIMENSIONS SHOWN ARE TO FINISH SURFACES UNLESS OTHERWISE NOTED. SPACING BETWEEN EQUIPMENT IS REQUIRED CLEARANCE. THEREFORE, IT IS CRITICAL TO FIELD VERIFY DIMENSIONS, AND SHOULD THERE BE ANY QUESTIONS REGARDING THE CONTRACT DOCUMENTS, EXISTING CONDITIONS AND/OR DESIGN INTENT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING THE WORK.
6. DETAILS ARE INTENDED TO SHOW DESIGN INTENT. MODIFICATIONS MAY BE REQUIRED TO SUIT JOB DIMENSIONS OR CONDITIONS, AND SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF THE WORK.
7. CONTRACTOR SHALL RECEIVE CLARIFICATION IN WRITING, AND SHALL RECEIVE IN WRITING AUTHORIZATION TO PROCEED BEFORE STARTING WORK ON ANY ITEMS NOT CLEARLY DEFINED OR IDENTIFIED BY THE CONTRACT DOCUMENTS.
8. CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK USING THE BEST CONSTRUCTION SKILLS AND ATTENTION. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES AND FOR COORDINATING ALL PORTIONS OF THE WORK UNDER CONTRACT, UNLESS OTHERWISE NOTED.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY OF THE WORK AREA, ADJACENT AREAS AND BUILDING OCCUPANTS THAT ARE LIKELY TO BE AFFECTED BY THE WORK UNDER THIS CONTRACT. WORK SHALL CONFORM TO ALL OSHA REQUIREMENTS.
4. CONTRACTOR SHALL COORDINATE HIS WORK WITH THE SUPERINTENDENT OF BUILDINGS & GROUNDS AND SCHEDULE HIS ACTIVITIES AND WORKING HOURS IN ACCORDANCE WITH THE REQUIREMENTS.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING HIS WORK WITH THE WORK OF OTHERS AS IT MAY RELATE TO RADIO EQUIPMENT, ANTENNAS AND ANY OTHER PORTIONS OF THE WORK.
12. INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS UNLESS SPECIFICALLY OTHERWISE INDICATED OR WHERE LOCAL CODES OR REGULATIONS TAKE PRECEDENCE.
13. MAKE NECESSARY PROVISIONS TO PROTECT EXISTING SURFACES, EQUIPMENT, IMPROVEMENTS, PIPING ETC. AND IMMEDIATELY REPAIR ANY DAMAGE THAT OCCURS DURING CONSTRUCTION.
14. IN DRILLING HOLES INTO CONCRETE WHETHER FOR FASTENING OR ANCHORING PURPOSES, OR PENETRATIONS THROUGH THE FLOOR FOR CONDUIT RUNS, PIPE RUNS, ETC., MUST BE CLEARLY UNDERSTOOD THAT REINFORCING STEEL SHALL NOT BE DRILLED INTO, CUT OR DAMAGED UNDER ANY CIRCUMSTANCES (UNLESS NOTED OTHERWISE). LOCATIONS OF REINFORCING STEEL ARE NOT DEFINITELY KNOWN AND THEREFORE MUST BE SEARCHED FOR BY APPROPRIATE METHODS AND EQUIPMENT.
15. REPAIR ALL EXISTING WALL SURFACES DAMAGED DURING CONSTRUCTION SUCH THAT THEY MATCH AND BLEND IN WITH ADJACENT SURFACES.
16. SEAL PENETRATIONS THROUGH FIRE RATED AREAS WITH U.L. LISTED AND FIRE CODE APPROVED MATERIALS.
17. KEEP CONTRACT AREA CLEAN, HAZARD FREE, AND DISPOSE OF ALL DIRT, DEBRIS, AND RUBBISH. EQUIPMENT NOT SPECIFIED AS REMAINING ON THE PROPERTY OF THE OWNER SHALL BE REMOVED. LEAVE PREMISES IN CLEAN CONDITION AND FREE FROM PAINT SPOTS, DUST, OR SMUDGES OF ANY NATURE. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL ITEMS UNTIL COMPLETION OF CONSTRUCTION.
18. MINIMUM BEND RADIUS OF ANTENNA CABLES SHALL BE IN ACCORDANCE WITH CABLE MANUFACTURERS RECOMMENDATIONS.
19. ALL EXISTING INACTIVE SEWER, WATER, GAS, ELECTRIC AND OTHER UTILITIES, WHICH INTERFERE WITH THE EXECUTION OF THE WORK, SHALL BE REMOVED AND/OR CAPPED, PLUGGED OR OTHERWISE DISCONTINUED AT POINTS WHICH WILL NOT INTERFERE WITH THE EXECUTION OF THE WORK, SUBJECT TO THE APPROVAL OF THE ENGINEER.
20. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, IF REQUIRED DURING CONSTRUCTION SHALL BE IN CONFORMANCE WITH JURISDICTIONAL OR STATE AND LOCAL GUIDELINES FOR EROSION AND SEDIMENT CONTROL AND COORDINATED WITH LOCAL REGULATORY AUTHORITIES.
21. LIGHT SHADED LINES AND NOTES REPRESENT WORK PREVIOUSLY DONE. DARK SHADED LINES AND NOTES REPRESENT THE SCOPE OF WORK FOR THIS PROJECT. CONTRACTOR SHALL VERIFY IF EXISTING CONSTRUCTION IS COMPLETE. CONTRACTOR SHALL NOTIFY ENGINEER OF ANY EXISTING CONDITIONS THAT DEVIATE FROM THE DRAWINGS PRIOR TO BEGINNING CONSTRUCTION.
22. CONTRACTOR SHALL SECURE ALL NECESSARY PERMITS AND/OR WIRING CERTIFICATES REQUIRED FOR THE ELECTRICAL SERVICE UPGRADE. IN ADDITION, CONTRACTOR SHALL PROVIDE ALL NECESSARY COORDINATION AND SCHEDULING WITH THE SERVING ELECTRICAL UTILITY AND LOCAL INSPECTION AUTHORITIES.
23. CONTRACTOR TO VERIFY ALL ASPECTS OF THE EXISTING STRUCTURE FOR CONFORMITY WITH THE VALUES SHOWN IN THESE DRAWINGS AND NOTIFY THE E.O.R. IF ANY DISCREPANCIES ARE FOUND. ALL ELEMENTS OF EXISTING STRUCTURE TO REMAIN UNDISTURBED, U.N.O.

SITE WORK NOTES

1. DO NOT EXCAVATE OR DISTURB BEYOND THE PROPERTY LINES OR LEASE LINES, UNLESS OTHERWISE NOTED.
2. DO NOT SCALE BUILDING DIMENSIONS FROM DRAWING.
3. SIZE, LOCATION AND TYPE OF ANY UNDERGROUND UTILITIES OR IMPROVEMENTS SHALL BE ACCURATELY NOTED AND PLACED ON AS-BUILT DRAWINGS BY GENERAL CONTRACTOR AND ISSUED TO ARCHITECT/ENGINEER AT COMPLETION OF PROJECT.
4. ALL EXISTING UTILITIES, FACILITIES, CONDITIONS AND THEIR DIMENSIONS SHOWN ON PLANS HAVE BEEN PLOTTED FROM AVAILABLE RECORDS. THE ENGINEER AND OWNER ASSUME NOT RESPONSIBILITY WHATSOEVER AS TO THE SUFFICIENCY OR ACCURACY OF THE INFORMATION SHOWN ON THE PLANS OR THE MANNER OF THEIR REMOVAL OR ADJUSTMENT. CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING EXACT LOCATION OF ALL EXISTING UTILITIES AND FACILITIES PRIOR TO START OF CONSTRUCTION. CONTRACTOR SHALL ALSO OBTAIN FROM EACH UTILITY COMPANY DETAILED INFORMATION RELATIVE TO WORKING SCHEDULES AND METHODS OF REMOVING OR ADJUSTING EXISTING UTILITIES.
5. CONTRACTOR SHALL VERIFY ALL EXISTING UTILITIES BOTH HORIZONTALLY AND VERTICALLY PRIOR TO START OF CONSTRUCTION. ANY DISCREPANCIES OR DOUBTS AS TO THE INTERPRETATION OF PLANS SHALL BE IMMEDIATELY REPORTED TO THE ARCHITECT/ENGINEER FOR RESOLUTION AND INSTRUCTION, AND NO FURTHER WORK SHALL BE PERFORMED UNTIL THE DISCREPANCY IS CHECKED AND CORRECTED BY THE ARCHITECT/ENGINEER. FAILURE TO SECURE SUCH INSTRUCTION MEANS CONTRACTOR WILL HAVE WORKED AT HIS/HER OWN RISK AND EXPENSE.
6. CONTRACTOR SHALL CALL LOCAL DIGGER HOT LINE FOR UTILITY LOCATIONS 48 HOURS PRIOR TO START OF CONSTRUCTION.
7. ALL NEW AND EXISTING UTILITY STRUCTURES ON SITE AND IN AREAS TO BE DISTURBED BY CONSTRUCTION SHALL BE ADJUSTED TO FINISH ELEVATIONS PRIOR TO FINAL INSPECTION OF WORK.
8. GRADING OF THE SITE WORK AREA IS TO BE SMOOTH AND CONTINUOUS IN SLOPE AND IS TO FEATHER INTO EXISTING GRADES AT THE GRADING LIMITS.
9. ALL TEMPORARY EXCAVATIONS FOR THE INSTALLATION OF FOUNDATIONS, UTILITIES, ETC., SHALL BE PROPERLY LAID BACK OR BRACED IN ACCORDANCE WITH CORRECT OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REQUIREMENTS.
10. STRUCTURAL FILLS SUPPORTING PAVEMENTS SHALL BE COMPACTED TO 95% OF MAXIMUM STANDARD PROCTOR DRY DENSITY.
11. NEW GRADES NOT IN BUILDING AND DRIVEWAY IMPROVEMENT AREA TO BE ACHIEVED BY FILLING WITH APPROVED CLEAN FILL AND COMPACTED TO 95% OF STANDARD PROCTOR DENSITY.
12. ALL FILL SHALL BE PLACED IN UNIFORM LIFTS. THE LIFTS THICKNESS SHOULD NOT EXCEED THAT WHICH CAN BE PROPERLY COMPACTED THROUGHOUT ITS ENTIRE DEPTH WITH THE EQUIPMENT AVAILABLE.
13. ANY FILLS PLACED ON EXISTING SLOPES THAT ARE STEEPER THAN 10 HORIZONTAL TO 1 VERTICAL SHALL BE PROPERLY BENCHED INTO THE EXISTING SLOPE AS DIRECTED BY A GEOTECHNICAL ENGINEER.
14. CONTRACTOR SHALL CLEAN ENTIRE SITE DAILY AFTER CONSTRUCTION SUCH THAT NO PAPERS, THRASH, WEEDS, BRUSH OR ANY OTHER DEPOSITS WILL REMAIN. ALL MATERIALS COLLECTED DURING CLEANING OPERATIONS SHALL BE DISPOSED OF OFF-SITE BY THE GENERAL CONTRACTOR.
15. ALL TREES AND SHRUBS WHICH ARE NOT IN DIRECT CONFLICT WITH THE IMPROVEMENTS SHALL BE PROTECTED BY THE GENERAL CONTRACTOR.
16. ALL SITE WORK SHALL BE CAREFULLY COORDINATED BY GENERAL CONTRACTOR WITH LOCAL UTILITY COMPANY, TELEPHONE COMPANY, AND ANY OTHER UTILITY COMPANIES HAVING JURISDICTION OVER THIS LOCATION.

FOUNDATION, EXCAVATION AND BACKFILL NOTES

1. ALL FINAL GRADED SLOPES SHALL BE A MAXIMUM OF 3 HORIZONTAL TO 1 VERTICAL.
2. ALL EXCAVATIONS PREPARED FOR PLACEMENT OF CONCRETE SHALL BE OF UNDISTURBED SOILS, SUBSTANTIALLY HORIZONTAL AND FREE FROM ANY LOOSE, UNSUITABLE MATERIAL OR FROZEN SOILS, AND WITHOUT THE PRESENCE OF POUNDING WATER. DEWATERING FOR EXCESS GROUND WATER SHALL BE PROVIDED WHEN REQUIRED. COMPACTION OF SOILS UNDER CONCRETE PAD FOUNDATIONS SHALL NOT BE LESS THAN 95% OF THE MODIFIED PROCTOR MAXIMUM DRY DENSITY FOR THE SOIL IN ACCORDANCE WITH ASTM D1557.
3. CONCRETE FOUNDATIONS SHALL NOT BE PLACED ON ORGANIC OR UNSUITABLE MATERIAL. IF INADEQUATE BEARING CAPACITY IS REACHED AT THE DESIGNED EXCAVATION DEPTH, THE UNSATISFACTORY SOIL SHALL BE EXCAVATED TO ITS FULL DEPTH AND EITHER BE REPLACED WITH MECHANICALLY COMPACTED GRANULAR MATERIAL OR THE EXCAVATION SHALL BE FILLED WITH CONCRETE OF THE SAME TYPE SPECIFIED FOR THE FOUNDATION. CRUSHED STONE MAY BE USED TO STABILIZE THE BOTTOM OF THE EXCAVATION. ANY STONE SUB BASE MATERIAL, IF USED, SHALL NOT SUBSTITUTE FOR REQUIRED THICKNESS OF CONCRETE.
4. ALL EXCAVATIONS SHALL BE CLEAN OF UNSUITABLE MATERIAL SUCH AS VEGETATION, TRASH, DEBRIS, AND SO FORTH PRIOR TO BACK FILLING. BACK FILL SHALL CONSIST OF APPROVED MATERIALS SUCH AS EARTH, LOAM SANDY CLAY, SAND AND GRAVEL, OR SOFT SHALE, FREE FROM CLODS OR LARGE STONES OVER 2 1/2" MAX DIMENSIONS. ALL BACK FILL SHALL BE PLACED IN COMPACTED LAYERS.
5. ALL FILL MATERIALS AND FOUNDATION BACK FILL SHALL BE PLACED MAXIMUM 6" THICK LIFTS BEFORE COMPACTION. EACH LIFT SHALL BE WETTED IF REQUIRED AND COMPACTED TO NOT LESS THAN 95% OF THE MODIFIED PROCTOR MAXIMUM DRY DENSITY FOR SOIL IN ACCORDANCE WITH ASTM D1557.
6. NEWLY PLACED CONCRETE FOUNDATIONS SHALL CURE A MINIMUM OF 72 HRS PRIOR TO BACK FILLING.
7. FINISHED GRADING SHALL BE SLOPED TO PROVIDE POSITIVE DRAINAGE AND PREVENT STANDING WATER. THE FINAL (FINISH) ELEVATION OF SLAB FOUNDATIONS SHALL SLOPE AWAY IN ALL DIRECTIONS FROM THE CENTER. FINISH GRADE OF CONCRETE PADS SHALL BE A MAXIMUM OF 4 INCHES ABOVE FINAL FINISH GRADE ELEVATIONS. PROVIDE SURFACE FILL GRAVEL TO ESTABLISH SPECIFIED ELEVATIONS WHERE REQUIRED.
8. NEWLY GRADED SURFACE AREAS TO RECEIVE GRAVEL SHALL BE COVERED WITH GEOTEXTILE FABRIC TYPE: TYPAR-3401 AS MANUFACTURED BY "CONSTRUCTION MATERIAL 1-800-239-3841" OR AN APPROVED EQUIVALENT, SHOWN ON PLANS. THE GEOTEXTILE FABRIC SHALL BE BLACK IN COLOR TO CONTROL THE RECURRENCE OF VEGETATIVE GROWTH AND EXTEND TO WITHIN 1 FOOT OUTSIDE THE SITE FENCING OR ELECTRICAL GROUNDING SYSTEM PERIMETER WHICH EVER IS GREATER. ALL FABRIC SHALL BE COVERED WITH A MINIMUM OF 4" DEEP COMPACTED STONE OR GRAVEL AS SPECIFIED. I.E. FDOT TYPE No. 57 FOR FENCED COMPOUND; FDOT TYPE No. 67 FOR ACCESS DRIVE AREA.
9. IN ALL AREAS TO RECEIVE FILL, REMOVE ALL VEGETATION, TOPSOIL, DEBRIS, WET AND UNSATISFACTORY SOIL MATERIALS, OBSTRUCTIONS, AND DELETERIOUS MATERIALS FROM GROUND SURFACE. PLOW STRIP OR BREAK UP SLOPED SURFACES STEEPER THAN 1 VERTICAL TO 4 HORIZONTAL SUCH THAT FILL MATERIAL WILL BIND WITH EXISTING/PREPARED SOIL SURFACE.
10. WHEN SUB GRADE OR PREPARED GROUND SURFACE HAS A DENSITY LESS THAN THAT REQUIRED FOR THE FILL MATERIAL, SCARIFY THE GROUND SURFACE TO DEPTH REQUIRED, PULVERIZE, MOISTURE-CONDITION AND/OR AERATE THE SOILS AND RE-COMPACT TO THE REQUIRED DENSITY PRIOR TO PLACEMENT OF FILLS.
11. IN AREAS WHICH EXISTING GRAVEL SURFACING IS REMOVED OR DISTURBED DURING CONSTRUCTION OPERATIONS, REPLACE GRAVEL SURFACING TO MATCH ADJACENT GRAVEL SURFACING AND RESTORED TO THE SAME THICKNESS AND COMPACTION AS SPECIFIED. ALL RESTORED GRAVEL SURFACING SHALL BE FREE FROM CORRUGATIONS AND WAVES.
12. EXISTING GRAVEL SURFACING MAY BE EXCAVATED SEPARATELY AND REUSED WITH THE CONDITION THAT ANY UNFAVORABLE AMOUNTS OF ORGANIC MATTER, OR OTHER DELETERIOUS MATERIALS ARE REMOVED PRIOR TO REUSE. FURNISH ANY ADDITIONAL GRAVEL RESURFACING MATERIAL AS NEEDED TO PROVIDE A FULL DEPTH COMPACTED SURFACE THROUGHOUT SITE.
13. GRAVEL SUB SURFACE SHALL BE PREPARED TO REQUIRED COMPACTION AND SUB GRADE ELEVATIONS BEFORE GRAVEL SURFACING IS PLACED AND/OR RESTORED. ANY LOOSE OR DISTURBED MATERIALS SHALL BE THOROUGHLY COMPACTED AND ANY DEPRESSIONS IN THE SUB GRADE SHALL BE FILLED AND COMPACTED WITH APPROVED SELECTED MATERIAL. GRAVEL SURFACING MATERIAL SHALL NOT BE USED FOR FILLING DEPRESSIONS IN THE SUB GRADE.
14. PROTECT EXISTING GRAVEL SURFACING AND SUB GRADE IN AREAS WHERE EQUIPMENT LOADS WILL OPERATE.
15. DAMAGE TO EXISTING STRUCTURES AND/OR UTILITIES RESULTING FROM CONTRACTORS NEGLIGENCE SHALL BE REPAIRED AND/OR REPLACED TO THE OWNERS SATISFACTION AT NO ADDITIONAL COST TO THE CONTRACT.
16. ALL SUITABLE BORROW MATERIAL FOR BACK FILL OF THE SITE SHALL BE INCLUDED IN THE BID. EXCESS TOPSOIL AND UNSUITABLE MATERIAL SHALL BE DISPOSED OF OFF SITE AT LOCATIONS APPROVED BY GOVERNING AGENCIES AT NO ADDITIONAL COST TO THE CONTRACT.
17. FOUNDATION DESIGN IS BASED UPON 1,500 PSF ALLOWABLE BEARING PRESSURE. INDEPENDENT SOILS TESTING BY A LICENSED GEOTECHNICAL ENGINEER IS STRONGLY RECOMMENDED TO VERIFY SOIL BEARING CAPACITY, SLOPE STABILITY, AND ALL OTHER APPLICABLE SOILS PARAMETERS.

STRUCTURAL STEEL NOTES

1. ALL STEEL WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE AISC MANUAL OF STEEL CONSTRUCTION. STEEL SECTIONS SHALL BE IN ACCORDANCE WITH ASTM AS INDICATED BELOW:
   W-SHAPES: ASTM A992, 50 KSI
   ANGLES, BARS CHANNELS: ASTM A36, 36 KSI
   HSS SECTIONS: ASTM 500, 46 KSI
   PIPE SECTIONS: ASTM A53-B, 35 KSI
2. ALL EXTERIOR EXPOSED STEEL AND HARDWARE SHALL BE HOT DIPPED GALVANIZED.
3. ALL WELDING SHALL BE PERFORMED USING E70XX ELECTRODES AND WELDING SHALL CONFORM TO AISC. WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLE J2.4 IN THE AISC "MANUAL OF STEEL CONSTRUCTION". PAINTED SURFACES SHALL BE TOUCHED UP. ALL WELDING SHALL BE PERFORMED IN AN APPROVED SHOP.
4. ALL BOLTS FOR STEEL TO STEEL CONNECTIONS TO BE PER ASTM A325. HOLES TO BE 1/16" DIA. LARGER THAN BOLT, U.N.O.
5. NON-STRUCTURAL CONNECTIONS FOR STEEL GRATING MAY USE 5/8"Ø ASTM A 307 BOLTS UNLESS NOTED OTHERWISE.
6. FIELD MODIFICATIONS ARE TO BE COATED WITH ZINC ENRICHED PAINT.
7. HOLES TO RECEIVE EXPANSION/WEDGE ANCHORS SHALL CONFORM TO MANUFACTURER'S RECOMMENDATION FOR EMBEDMENT DEPTH AND DIAMETER. LOCATE AND AVOID CUTTING EXISTING REBAR OR TENDONS WHEN DRILLING HOLES IN ELEVATED CONCRETE SLABS OR CONCRETE WALLS.
8. USE AND INSTALLATION OF CONCRETE EXPANSION/WEDGE ANCHOR, SHALL BE PER ICC & MANUFACTURER'S WRITTEN RECOMMENDED PROCEDURES. THIRD PARTY SPECIAL INSPECTION IS REQUIRED FOR CONCRETE EXPANSION ANCHORS (I.E. SIMPSON STRONG-BOLT 2 WEDGE ANCHORS PER ESR-3037). INSTALLATION OF WEDGE ANCHORS IN MASONRY IS NOT PERMITTED.

HARMONI TOWERS

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DRAWN BY:	CL
CHECKED BY:	CL

DRAWING VERSION

VER.	DATE	DESCRIPTION
1	01/16/25	PRELIM CONST DRAWINGS

LICENSER

PROJECT INFORMATION

MOSSYROCK

262 SKYVIEW DR
MOSSYROCK, WA 98564

SHEET TITLE

GENERAL NOTES

SHEET NO.

GN1.0

STRUCTURAL CONCRETE NOTES

1. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE ACI 318-14 AND THE SPECIFICATION FOR CAST-IN-PLACE CONCRETE.

2. ALL CONCRETE FOR SLABS ON GRADE, SHELTER FOUNDATION, AND PIER FOUNDATIONS FOR FENCES, ICE BRIDGE, AND H-FRAME SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH fc'=3,000 PSI AT 28 DAYS UNLESS NOTED OTHERWISE. SPECIAL INSPECTION REQUIRED AS NOTED.

3. REINFORCING STEEL SHALL CONFORM TO ASTM A 615, GRADE 60, DEFORMED UNLESS NOTED OTHERWISE. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185 WELDED STEEL WIRE FABRIC UNLESS NOTED OTHERWISE. SPLICES CLASS "B" AND ALL HOOKS SHALL BE STANDARD UNLESS NOTED OTHERWISE.

4. THE FOLLOWING MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR REINFORCING STEEL UNLESS SHOWN OTHERWISE ON DRAWINGS:

   CONCRETE CAST AGAINST EARTH.....3 IN.

   CONCRETE EXPOSED TO EARTH OR WEATHER:
   #6 AND LARGER.....2 IN.
   #5 AND SMALLER & WWF.....1 1/2 IN.

   CONCRETE NOT EXPOSED TO EARTH OR WEATHER OR NOT CAST AGAINST THE GROUND:
   SLAB AND WALL.....3/4 IN.
   BEAMS AND COLUMNS.....1 1/2 IN.

5. A 3/4" CHAMFER SHALL BE PROVIDED AT ALL EXPOSED EDGES OF CONCRETE U.N.O. IN ACCORDANCE WITH ACI 301, LATEST EDITION, SECTION 4.

6. HOLES TO RECEIVE EXPANSION/WEDGE ANCHORS SHALL BE 1/8" LARGER IN DIAMETER THAN THE ANCHOR BOLT, DOWEL OR ROD AND SHALL CONFORM TO MANUFACTURER'S RECOMMENDATION FOR EMBEDMENT DEPTH OR AS SHOWN ON THE DRAWINGS. LOCATE AND AVOID CUTTING EXISTING REBAR WHEN DRILLING HOLES IN ELEVATED CONCRETE SLABS.

7. USE AND INSTALLATION OF CONCRETE ADHESIVE AND EXPANSION/WEDGE ANCHORS SHALL BE PER ICC & MANUFACTURER'S WRITTEN RECOMMENDED PROCEDURES.

8. FOUNDATION DESIGN IS BASED ON PRESUMPTIVE SOIL PARAMETERS. IT IS STRONGLY RECOMMENDED THAT INDEPENDENT SOILS TESTING BE PERFORMED BY A LICENSED GEOTECHNICAL ENGINEER TO VERIFY SOIL BEARING CAPACITY, SLOPE STABILITY, AND ALL OTHER RELATED SOIL PARAMETERS.

SPECIAL INSPECTION NOTES

1. CONTRACTOR SHALL PROVIDE REQUIRED SPECIAL INSPECTIONS PERFORMED BY AN INDEPENDENT INSPECTOR, APPROVED BY CARRIER AND THE LOCAL JURISDICTION, AS REQUIRED BY IBC SECTION 1704 AND 1705 FOR THE FOLLOWING:

A. STRUCTURAL STEEL:
   i. ALL HIGH STRENGTH BOLT INSTALLATIONS; BOLTING INSPECTION TASKS SHALL BE IN ACCORDANCE WITH TABLES N5.6-1, N5.6-2, AND N5.6-3 PER AISC 360-10.
   ii. FIELD WELDING (IF UTILIZED).

B. BOLTS AND ANCHORS IN CONCRETE:
   i. RETROFIT ANCHORS IN CONCRETE (ASHESIVE/EPOXY, EXPANSION, WEDGE, OR SCREW TYPE ANCHORS): INSPECT SIZE, LENGTH, CLEANLINESS, AND INSTALLATION PER MANUFACTURER'S RECOMMENDATIONS.

C. CONCRETE CONSTRUCTION:
   i. VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION SHALL BE IN ACCORDANCE WITH IBC SECTION 1705, TABLE 1705.3.

SPECIAL INSPECTION NOTES

2. PROVIDE SPECIAL INSPECTIONS FOR OTHER ITEMS NOTED ON DRAWINGS TO CONFIRM COMPLIANCE WITH CONTRACT DOCUMENTS.

3. THE SPECIAL INSPECTOR SHALL PROVIDE A COPY OF THE REPORT TO THE OWNER, ARCHITECT, STRUCTURAL ENGINEER, CONTRACTOR, AND BUILDING OFFICIAL.

4. CONTINUOUS THIRD PARTY SPECIAL INSPECTION REQUIRED FOR ALL BELZONA 1111 MOUNTED PLATES AND HARDWARE.

INSPECTION OF HIGH-STRENGTH BOLTING (PER AISC 360-16, SECTION N5):

OBSERVATION OF BOLTING OPERATIONS SHALL BE THE PRIMARY METHOD USED TO CONFIRM THAT THE MATERIALS, PROCEDURES AND WORKMANSHIP INCORPORATED IN CONSTRUCTION ARE IN CONFORMANCE WITH THE CONSTRUCTION DOCUMENTS AND THE PROVISIONS OF THE RCSC SPECIFICATION.

(1) FOR SNUG-TIGHT JOINTS, PRE-INSTALLATION VERIFICATION TESTING AS SPECIFIED IN TABLE N5.6-1 AND MONITORING OF THE INSTALLATION PROCEDURES AS SPECIFIED IN TABLE N5.6-2 ARE NOT APPLICABLE. THE QCI AND QAI NEED NOT BE PRESENT DURING THE INSTALLATION OF FASTENERS IN SNUG-TIGHT JOINTS.
(2) FOR PRETENSIONED JOINTS AND SLIP-CRITICAL JOINTS, WHEN THE INSTALLER IS USING THE TURN-OF-NUT METHOD WITH MATCHMARKING TECHNIQUES, THE DIRECT-TENSION-INDICATOR METHOD, OR THE TWIST-OFF-TYPE TENSION CONTROL BOLT METHOD,MONITORING OF BOLT PRETENSIONING PROCEDURES SHALL BE AS SPECIFIED IN TABLE N5.6-2. THE QCI AND QAI NEED NOT BE PRESENT DURING THE INSTALLATION OF FASTENERS WHEN THESE METHODS ARE USED BY THE INSTALLER.
(3) FOR PRETENSIONED JOINTS AND SLIP-CRITICAL JOINTS, WHEN THE INSTALLER IS USING THE CALIBRATED WRENCH METHOD OR THE TURN-OF-NUT METHOD WITHOUT MATCHMARKING, MONITORING OF BOLT PRETENSIONING PROCEDURES SHALL BE AS SPECIFIED IN TABLE N5.6-2. THE QCI AND QAI SHALL BE ENGAGED IN THEIR ASSIGNED INSPECTION DUTIES DURING INSTALLATION OF FASTENERS WHEN THESE METHODS ARE USED BY THE INSTALLER.

AS A MINIMUM, BOLTING INSPECTION TASKS SHALL BE IN ACCORDANCE WITH TABLES N5.6-1, N5.6-2 AND N5.6-3. IN THESE TABLES, THE INSPECTION TASKS ARE AS FOLLOWS:

O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS.
P - PERFORM THESE TASKS FOR EACH BOLTED CONNECTION.
QC - QUALITY CONTROL TASKS TO BE PERFORMED BY STEEL FABRICATOR OR ERECTOR
QA - QUALITY ASSURANCE TASKS TO BE PERFORMED BY A SPECIAL INSPECTION AGENCY OR INDIVIDUALS DEFINED BY AWS B5.1, OR INDIVIDUALS QUALIFIED UNDER THE PROVISIONS OF AWS D1.1/D1.1M SUBCLAUSE 6.1.4

TABLE N5.6-1; INSPECTION TASKS PRIOR TO BOLTING

INSPECTION TASKS PRIOR TO BOLTING	QC	QA
MANUFACTURER'S CERTIFICATIONS AVAILABLE FOR FASTENER MATERIALS	O	P
FASTENERS MARKED IN ACCORDANCE WITH ASTM REQUIREMENTS	O	O
PROPER FASTENERS SELECTED FOR THE JOINT DETAIL (GRADE, TYPE, BOLT LENGTH IF THREADS ARE TO BE EXCLUDED FROM SHEAR PLANE)	O	O
PROPER BOLTING PROCEDURE SELECTED FOR JOINT DETAIL	O	O
CONNECTING ELEMENTS, INCLUDING THE APPROPRIATE FAYING SURFACE CONDITION AND HOLE PREPARATION, IF SPECIFIED, MEET APPLICABLE REQUIREMENTS	O	O
PRE-INSTALLATION VERIFICAITON TESTING BY INSTALLATION PERSONNEL OBSERVED AND DOCUMENTED FOR FASTENER ASSEMBLIES AND METHODS USED	P	O
PROPER STORAGE PROVIDED FOR BOLTS, NUTS, WASHERS, AND OTHER FASTENER COMPONENTS	O	O

TABLE N5.6-2; INSPECTION TASKS DURING BOLTING

INSPECTION TASKS DURING BOLTING	QC	QA
FASTENER ASSEMBLIES, OF SUITABLE CONDITION, PLACED IN ALL HOLES AND WASHERS (IF REQUIRED) ARE POSITIONED AS REQUIRED	O	O
JOINT BROUGHT TO THE SNUG-TIGHT CONDITION PRIOR TO THE PRETENSIONING OPERATION	O	O
FASTENER COMPONENT NOT TURNED BY THE WRENCH PREVENTED FROM ROTATING	O	O
FASTENERS ARE PRETENSIONED IN ACCORDANCE WITH THE RCSC*SPECIFICATION*, PROGRESSING SYSTEMATICALLY FROM THE MOST RIGID POINT TOWARD THE FREE EDGES	O	O

TABLE N5.6-3; INSPECTION TASKS AFTER BOLTING

INSPECTION TASKS DURING BOLTING	QC	QA
DOCUMENT ACCEPTANCE OR REJECTION OF BOLTED CONNECTIONS	P	P

REQUIRED STRUCTURAL OBSERVATION

STRUCTURAL OBSERVATION FOR SEISMIC RESISTANCE; STRUCTURE HEIGHT > 75' PER IBC 1704.5.1

DRAWING ABBREVIATIONS

AFF	ABOVE FINISH FLOOR	LF	LINEAR FEET
AGL	ABOVE GRADE LEVEL	MAX	MAXIMUM
AWG	AMERICAN WIRE GAUGE	MECH	MECHANICAL
AC	AIR CONDITIONING	MFR	MANUFACTURER
ADJ	ADJUSTABLE	MGR	MANAGER
APPROX	APPROXIMATELY	MIN	MINIMUM
AZ	AZIMUTH	MISC	MISCELLANEOUS
BLDG	BUILDING	MTL	METAL
CM	CONSTRUCTION MANAGER	MTZL	METALIZE(D)
CAB	CABINET	MW	MICROWAVE
CL	CENTERLINE	NEC	NATIONAL ELECTRICAL CODE
CLG	CEILING	(N)	NEW
CLR	CLEAR	NIC	NOT IN CONTRACT
CO	COPPER	NTS	NOT TO SCALE
CONC	CONCRETE	N/A	NOT APPLICABLE
COND	CONDUIT	OC	ON CENTER
CONST	CONSTRUCTION	OD	OUTSIDE DIAMETER
CONT	CONTINUOUS	OP	OVERHEAD POWER
DEMO	DEMOLISH	OT	OVERHEAD FIBER
DIA	DIAMETER	OPP	OPPOSITE
DIM	DIMENSION	PL	PROPERTY LINE
DN	DOWN	PLYWD	PLYWOOD
DTL	DETAIL	PM	PROJECT MANAGER
DWG	DRAWING	PROP	PROPERTY
EA	EACH	PT	PRESSURE TREATED
ELECT	ELECTRICAL	RO	ROUGH OPENING
ELEV	ELEVATION	ROW	RIGHT OF WAY
EOR	ENGINEER OF RECORD	RRU/RRH	REMOTE RADIO UNIT
EQ	EQUAL	REQ	REQUIRED
EQUIP	EQUIPMENT	SBTC	SOLID BARE TINNED COPPER
(E)	EXISTING	SF	SQUARE FEET
EXT	EXTERIOR	SHT	SHEET
FIN	FINISH	SPEC	SPECIFICATION
FLR	FLOOR	SQ	SQUARE
FT	FOOT, FEET	SS	STAINLESS STEEL
GA	GAUGE	STL	STEEL
GALV	GALVANIZED	STRUCT	STRUCTURE, STRUCTURAL
GC	GENERAL CONTRACTOR	TOC	TOP OF CONCRETE
GWB	GYPSUM WALL BOARD	TOM	TOP OF MASONRY
GR	GRADE	THRU	THROUGH
GRND	GROUND	TNND	TINNED
HVAC	HEATING, VENTING & AIR CONDITIONING	TYP	TYPICAL
HORIZ	HORIZONTAL	UG	UNDERGROUND
HT	HEIGHT	UNO	UNLESS NOTED OTHERWISE
IBC	INTERNATIONAL BUILDING CODE	UP	UNDERGROUND POWER
ID	INSIDE DIAMETER	UF	UNDERGROUND FIBER
IN	INCH	VIF	VERIFY IN FIELD
INSUL	INSULATION	VERT	VERTICAL
INT	INTERIOR	WP	WATERPROOF
JBOX	JUNCTION BOX	W/	WITH
LB(S)	POUND(S)	W/O	WITHOUT

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PROJECT INFORMATION

MOSSYROCK

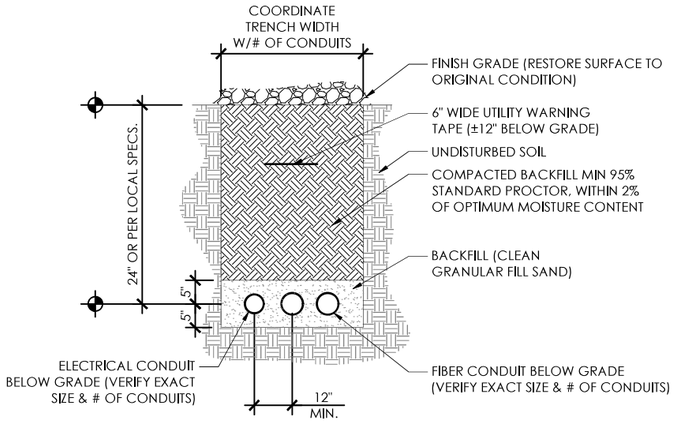
262 SKYVIEW DR
MOSSYROCK, WA 98564

SHEET TITLE

GENERAL NOTES

SHEET NO.

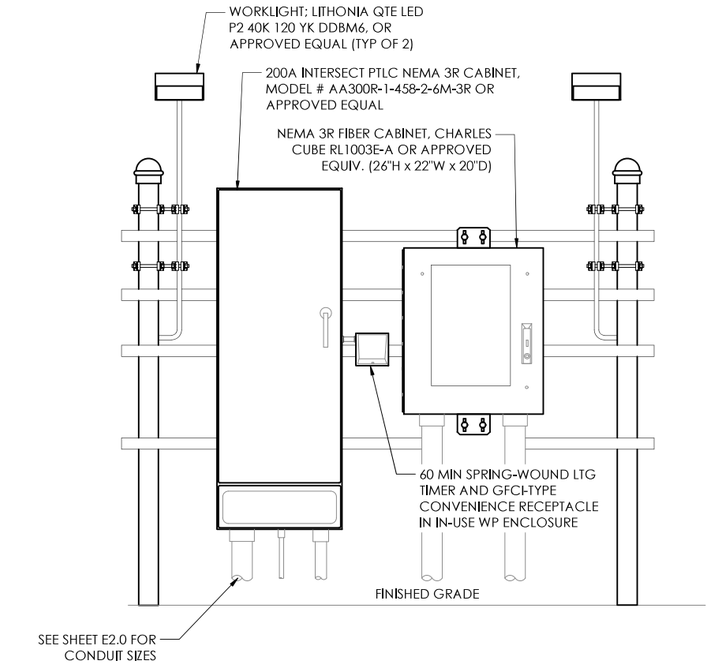
GN2.0



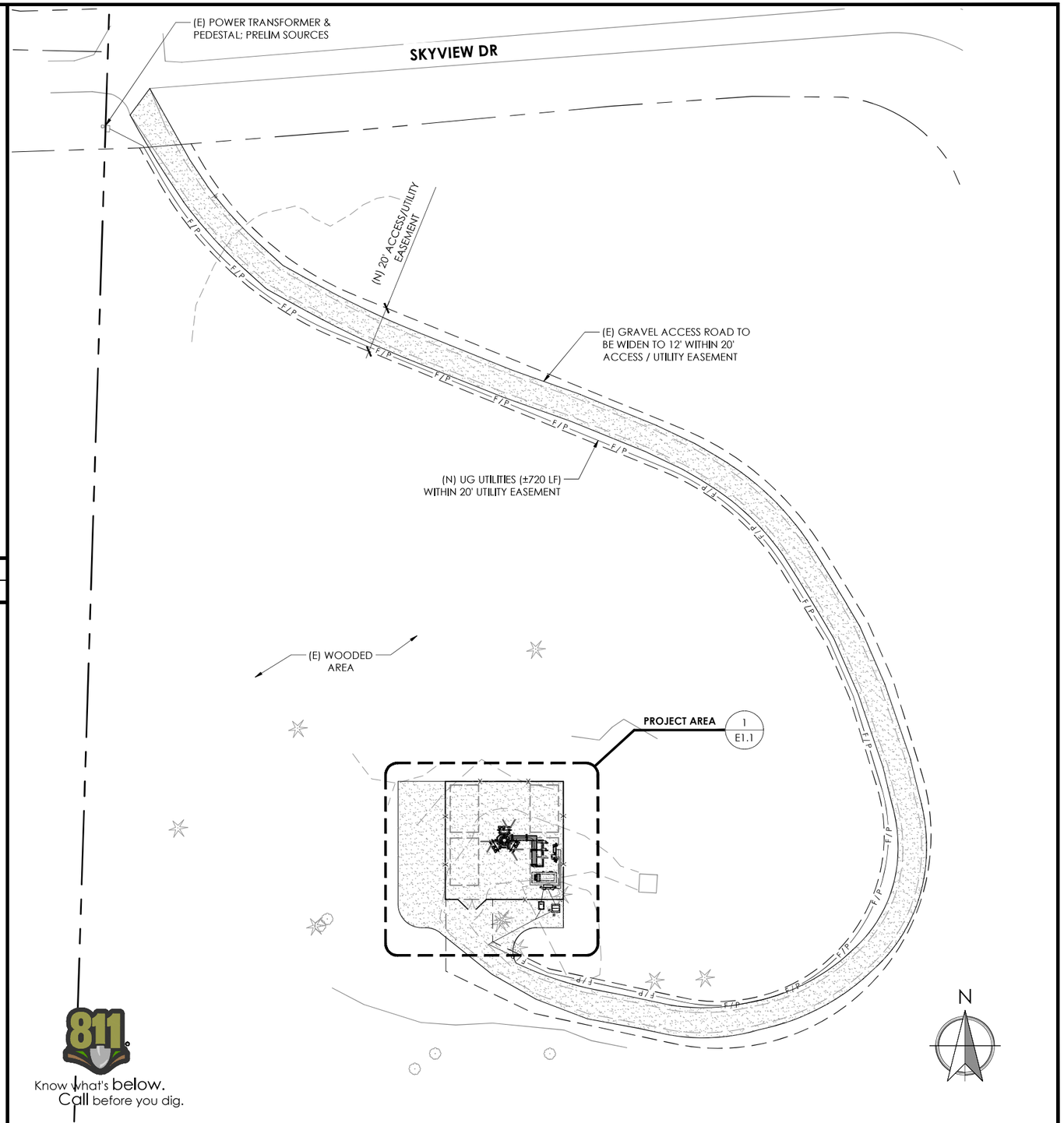
NOTES:

1. INSTALL ALL UNDERGROUND UTILITIES PER LOCAL UTILITY REQUIREMENTS.
2. LOCATE ALL UNDERGROUND UTILITIES PRIOR TO TRENCHING / EXCAVATION.
3. COORDINATE SIZE, TYPE, AND STUB-UP LOCATIONS WITH LOCAL UTILITY COMPANIES REQUIREMENTS.
4. REFER TO ELECT PLAN FOR EXACT SIZE AND LOCATION.
5. ALL SWEEPS TO HAVE A MINIMUM BENDING RADIUS OF 36" UNLESS NOTED OTHERWISE.
6. CONTRACTOR TO MAINTAIN MIN. SEPARATION REQUIREMENTS BETWEEN MULTIPLE CONDUITS PER LOCAL UTILITY REQUIREMENTS.
7. COMPACT BACKFILL TO 95% PROCTOR DENSITY AT ALL DRIVEWAY OR HARD SURFACED AREAS. COMPACT TO 90% PROCTOR DENSITY ALL OTHER AREAS UNLESS NOTED OTHERWISE, REFER TO GEOTECHNICAL REPORT.
8. CONTRACTOR TO RESTORE TRENCH TO ITS ORIGINAL CONDITION BY SEEDING / SODDING GRASS AREAS, OR REPLACING ASPHALT / CONCRETE TO THEIR ORIGINAL CROSS SECTION.
9. CONTRACTOR TO OBTAIN NECESSARY PERMITS FOR ALL RIGHT-OF-WAY WORK.

1	UTILITY TRENCH	11X17 SCALE: NTS
		22 x 34 SCALE: NTS



2	UTILITY H-FRAME	11X17 SCALE: NTS
		22 x 34 SCALE: NTS



811 Know what's below. Call before you dig.

3	UTILITY SITE PLAN	11 X 17 SCALE: 1" = 400'-0"
		22 X 34 SCALE: 1" = 200'-0"

0' 200' 400' 800'

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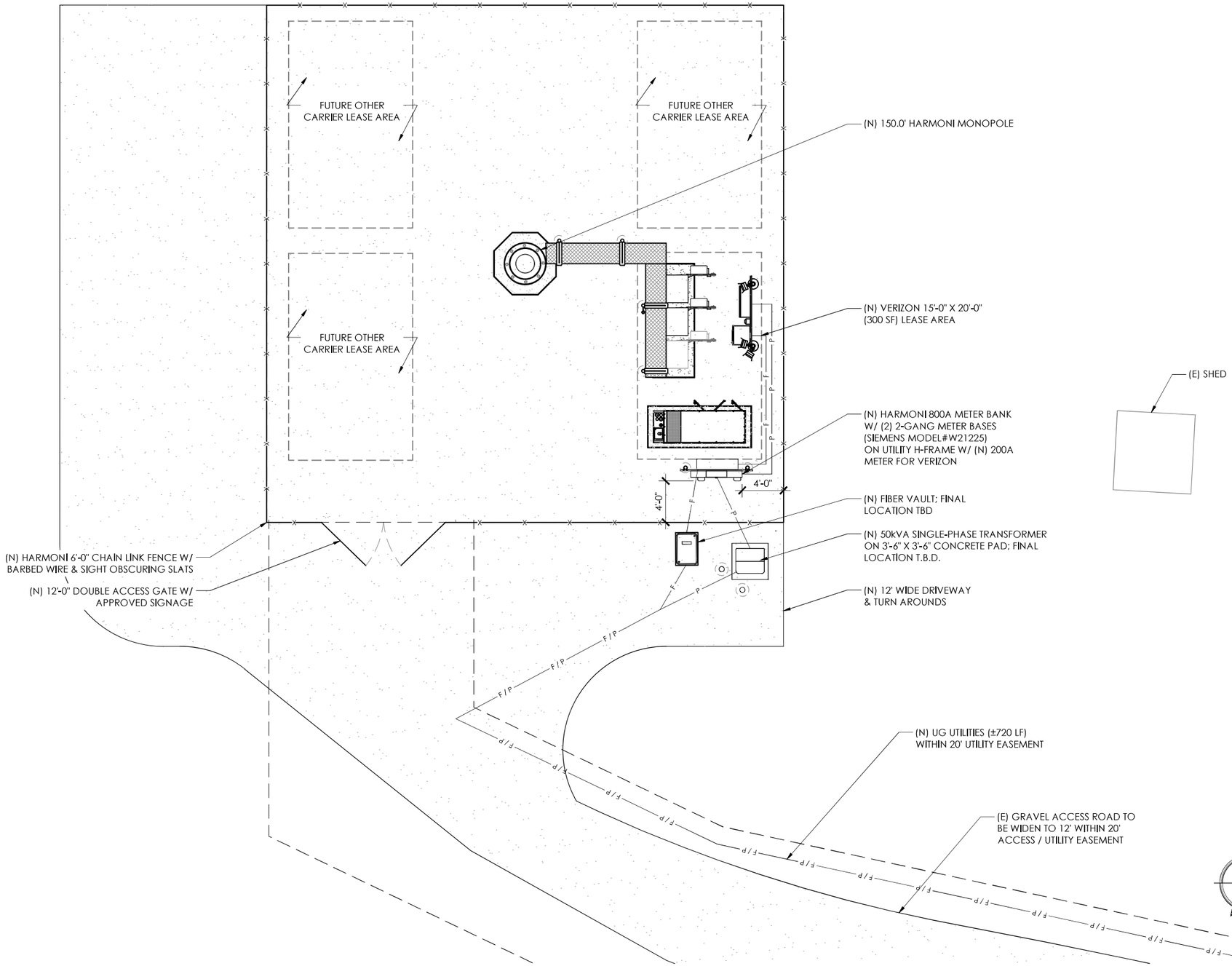
SHEET TITLE

UTILITY SITE PLAN

SHEET NO.

E1.0



1 ENLARGED UTILITY SITE PLAN

11 X 17 SCALE: 3/32" = 1'-0"
22 X 34 SCALE: 3/16" = 1'-0"

0' 10' 20'

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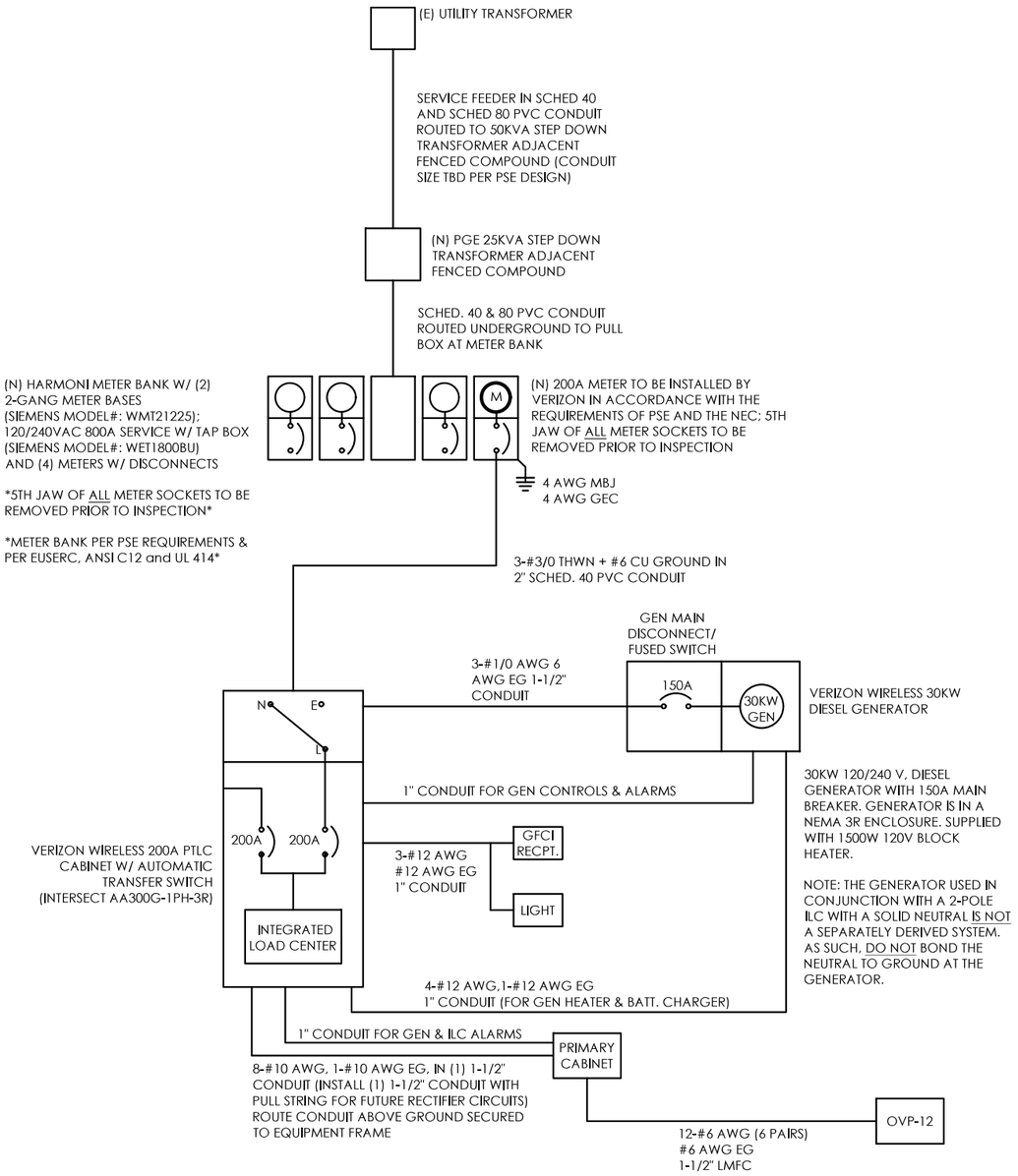
SHEET TITLE

ENLARGED
UTILITY SITE PLAN

SHEET NO.

E1.1



NOTES:
1. ALL EQUIPMENT SHALL BE NEMA 3R RATED.
2. ALL EQUIPMENT SHALL BE LIGHTNING PROTECTED IN ACCORDANCE WITH VERIZON WIRELESS STANDARDS.
3. CONDUCTOR SIZES AND DISTANCES HAVE BEEN SIZED FOR 3% MAX VOLTAGE DROP (TOTAL SYSTEM VOLTAGE DROP ON BOTH FEEDERS AND BRANCH CIRCUITS TO THE FARTHEST DEMAND SHALL NOT EXCEED 5%).
4. WIRE SIZING AND MAXIMUM DISTANCE FROM GENERATOR TO PTLC ASSUMES POWER FACTOR OF 0.9.
5. BELOW GRADE CONDUIT SHALL BE SCHEDEDULE 40 PVC. ABOVE GRADE CONDUIT SHALL BE SCHEDEDULE 80 PVC. BELOW GRADE PVC CONDUIT SHALL TRANSITION TO ABOVE GRADE PVC PRIOR TO RISING ABOVE GRADE. ALL BENDS SHALL HAVE A MINIMUM 24" RADIUS. VERIFY CONDUIT TYPE WITH LOCAL CONSTRUCTION MANAGER AND ADJUST IF NECESSARY. ALL CONDUIT SHALL MEET NEC, STATE, AND LOCAL CODE REQUIREMENTS AS REQUIRED.

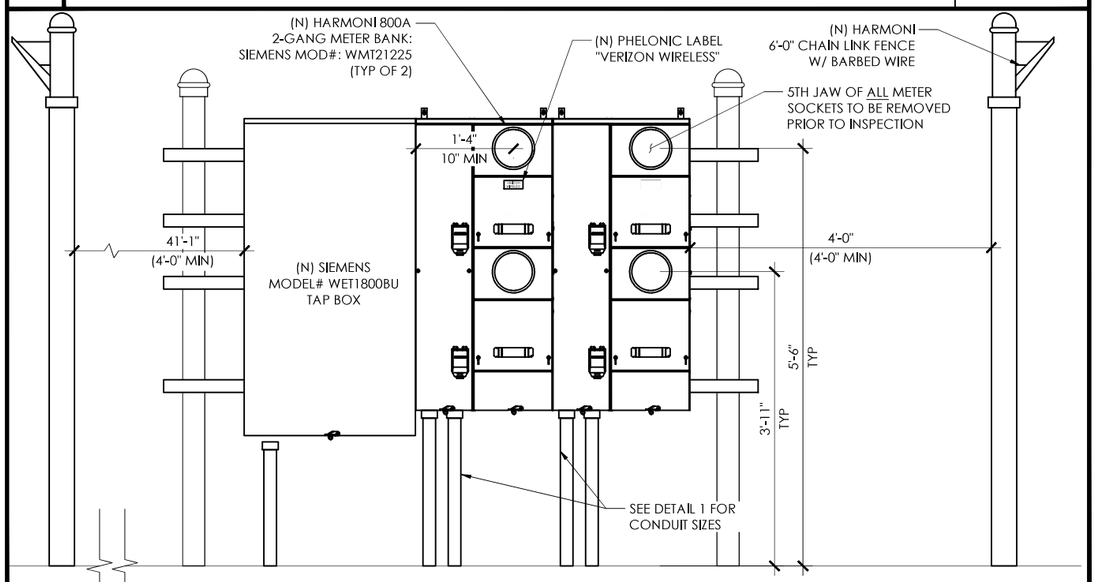
1 | ONE-LINE DIAGRAM | 11X17 SCALE: NTS | 22 x 34 SCALE: NTS

PANEL NAME:	VZW PTLC			MODEL NUMBER:	INTERSECT AA300G-1PH-3R										
RATED VOLTAGE:	240	120	VOLTS	PHASE/WIRE:	1/3	ENCLOSURE TYPE:	NEMA 3R WITHIN PTLC								
MAIN BREAKER:	200	AMPS		BUS RATING:	200		KEY DOOR LATCH:	YES							
MOUNT:	SURFACE			NEUTRAL BAR:	YES		HINGED DOOR:	YES							

POS	DEMAND FACTOR	BUS AMPS L1	BUS AMPS L2	LOAD	POLES	AMPS	L1	L2	POLES	AMPS	LOAD	BUS AMPS L1	BUS AMPS L2	DEMAND FACTOR	POS
1	1.0	18		RECTIFIER	2	30A			30A	2	FUTURE RECTIFIER	18		1.0	2
3	1.0		18										18	1.0	4
5	1.0	18		RECTIFIER	2	30A			30A	2	FUTURE RECTIFIER	18		1.0	6
7	1.0		18										18	1.0	8
9	1.0	18		RECTIFIER	2	30A									10
11	1.0		18												12
13	1.0	18		RECTIFIER	2	30A									14
15	1.0		18												16
17	1.25	12		GFI RECEPT. /LIGHT	1	20A									18
19	1.25		12	ALTERNATOR HEATER	1	20A									20
21	1.25	5		BATT. CHARGER	1	20A									22
23															24
25															26
27															28
29															30
		93.25	87	:SUB TOTAL AMPS							SUB TOTAL AMPS:	36	36		
											FACTORED TOTAL AMPS:	129.25	123		

NOTES:
1. ALL CONDUCTORS ARE TYPE THWN (75°C) COPPER.
2. MAXIMUM LENGTH OF RECTIFIER CIRCUITS SHALL BE 50FT.
3. INTERSECT/ GENERAC INTEGRATED LOAD CENTER INCLUDES 200 AMP MAIN DISCONNECT AND AUTOMATIC TRANSFER SWITCH FOR PORTABLE OR PERMANENT GENERATOR.
4. RECTIFIER LOADS ARE CONSIDERED TO BE NON-CONTINUOUS.

2 | PANEL SCHEDEDULE | 11X17 SCALE: NTS | 22 x 34 SCALE: NTS



3 | HARMONI METER BASE DETAIL | 11X17 SCALE: NTS | 22 x 34 SCALE: NTS

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SHEET TITLE

ONE-LINE. DIAGRAMS & PANEL SCHEDULE

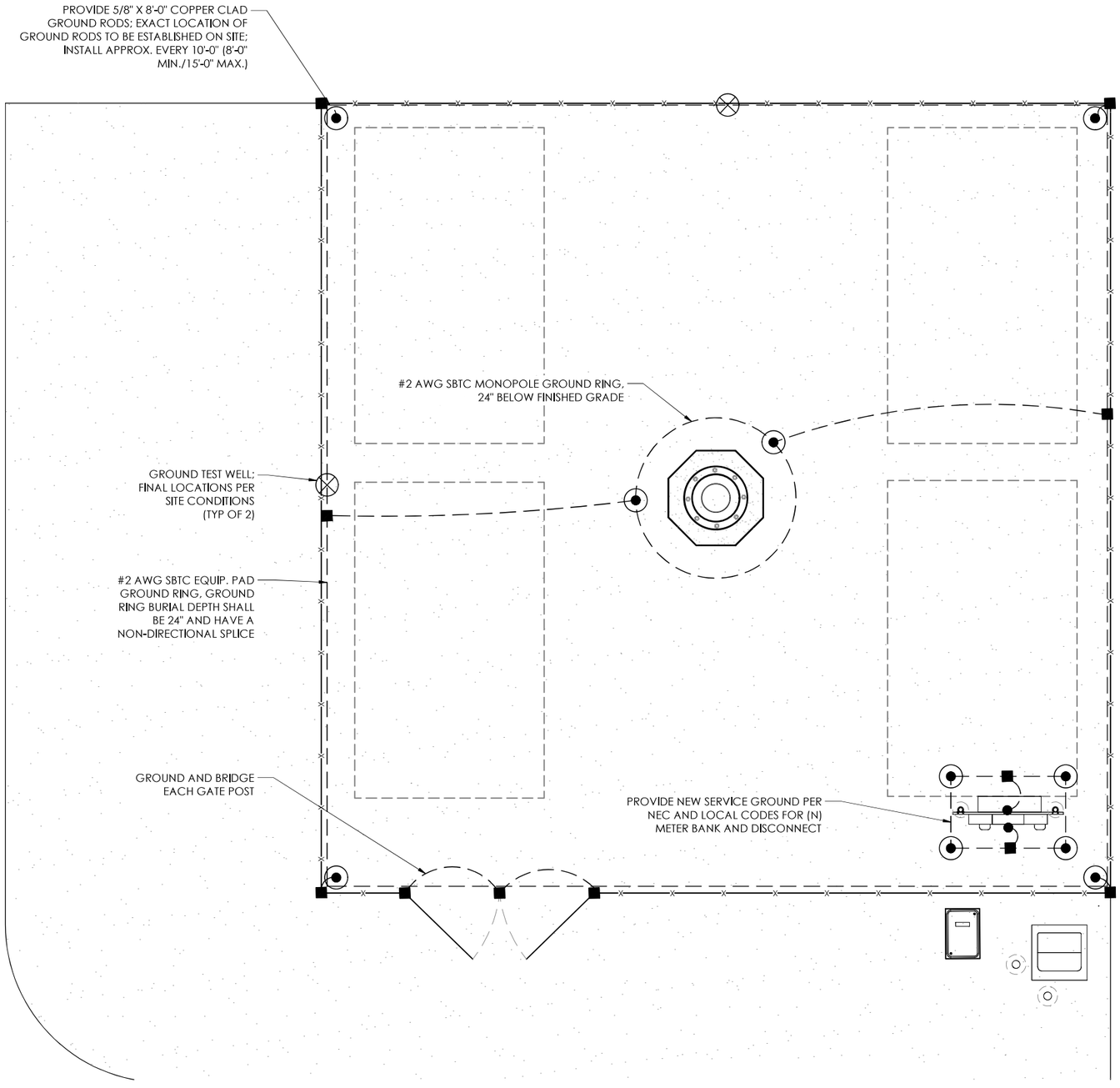
SHEET NO.

E2.0

1. DEPICTION OF GROUNDING DESIGN IS FOR CONCEPTUAL PURPOSES ONLY. CONTRACTOR TO DETERMINE FINAL ROUTING PER EXISTING SITE CONDITIONS.
2. GROUNDING SHALL COMPLY WITH LATEST EDITION OF THE NATIONAL ELECTRICAL CODE.
3. ALL GROUNDING SHALL CONFORM TO THE CURRENT CARRIER STANDARDS.
4. MINIMUM BENDING RADIUS FOR GROUND CONDUCTOR IS 8", WHEN BENDING IS NECESSARY. GROUND CONDUCTORS ARE TO BE AS STRAIGHT AS POSSIBLE.
5. ALL ABOVE GRADE GROUND LEADS TO BE SHEATHED IN CARFLEX-X-FLEX™ FLEXIBLE CONDUIT OR APPROVED EQUAL.
6. ALL GROUND BAR CONNECTIONS ARE TO BE 2 HOLE LUG COMPRESSION TYPE. STACKED CONNECTIONS ARE NOT ACCEPTABLE. BACK TO BACK CONNECTIONS ON OPPOSITE SIDES OF THE GROUND BAR WILL BE PERMITTED.
7. NO SPLICES PERMITTED IN GROUND CONDUCTORS.
8. ALL GROUNDING CONNECTORS TO BE CLEAN AND FREE OF PAINT AT THEIR MATING SURFACES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. USE PENETROX OR APPROVED EQUAL ANTIOXIDANT GREASE.
9. ENSURE ALL MECHANICAL CONNECTORS ARE TORQUED TO THE MANUFACTURER'S SPECIFIED VALUES.
10. MULTIPLE BONDS ON GROUND RODS TO BE SEPARATED BY AT LEAST 6".
11. MAXIMUM RESISTANCE OF THE COMPLETED GROUND SYSTEM SHALL NOT EXCEED A RESISTANCE OF 5 OHMS TO EARTH.
12. GROUND WIRES SHALL NOT BE INSTALLED THROUGH HOLES IN ANY METAL OBJECTS OR SUPPORTS TO PRECLUDE ESTABLISHING A "CHOKE" POINT.
13. FERROUS METAL CLIPS WHICH COMPLETELY SURROUND THE GROUND WIRE SHALL NOT BE USED. METAL CLIPS THAT DO NOT COMPLETELY SURROUND THE GROUND WIRE OR PLASTIC CLIPS ARE ACCEPTABLE.
14. ALL OUTDOOR CONNECTIONS TO BE EXOTHERMIC CADWELD, INTERIOR CONNECTIONS CAN BE A PROPERLY APPLIED CRIMP TYPE UNLESS OTHERWISE SPECIFIED.
15. GROUND BARS SHALL NOT BE FIELD MODIFIED.
16. ALL HORIZONTAL FENCE SECTIONS TO BE GROUNDED WITH 8" SINGLE BARREL GROUND STRAPS.
17. GROUND RING BURIAL DEPTH SHALL BE 24" AND HAVE A NON-DIRECTIONAL SPLICE.
18. A CERTIFIED CONTRACTOR WILL MAKE ALL MEASUREMENTS REQUIRED TO TEST THE GROUNDING SYSTEM, USING A MEGGER OR EQUIVALENT. THE ACCEPTABLE RESISTANCE MEASURED FOR THE GROUNDING SYSTEM WILL NOT EXCEED 5 OHMS RESISTANCE. THREE DISTANCES SHALL BE USED: 1 AT 100 FEET, 1 AT 70 FEET, AND 1 AT 35 FEET. THESE DISTANCES ARE SUBJECT TO A SITE BY SITE BASIS. VERIZON WIRELESS SHALL BE GIVEN 24 HOURS NOTICE BEFORE TESTING IS TO BE DONE. THE COST ASSOCIATED WITH GROUND TESTING WILL BE AT THE EXPENSE OF THE CONTRACTOR.
19. PROVIDE #2 TW GREEN JUMPER FROM EACH CABLE BRIDGE POST TO CABLE BRIDGE CHANNEL.

LEGEND

- ⊗ GROUND TEST WELL
- ⊙ GROUND ROD
- ■ CAD WELD CONNECTION
- ▲ MECHANICAL CONNECTION (DOUBLE HOLE LUG)
- ● CONNECT PER MFR SPECIFICATIONS
- GB GROUND BAR



N

1 GROUNDING PLAN

11X17 SCALE: NTS
22 x 34 SCALE: NTS

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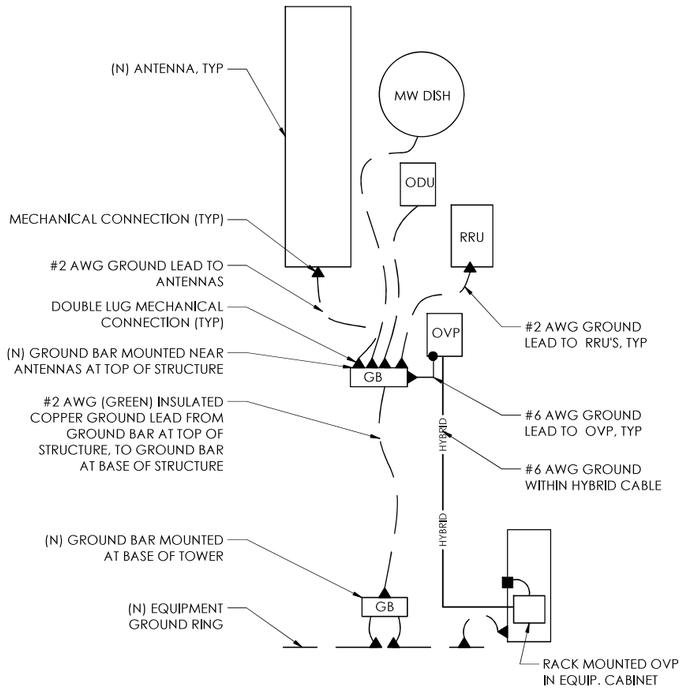
SHEET TITLE

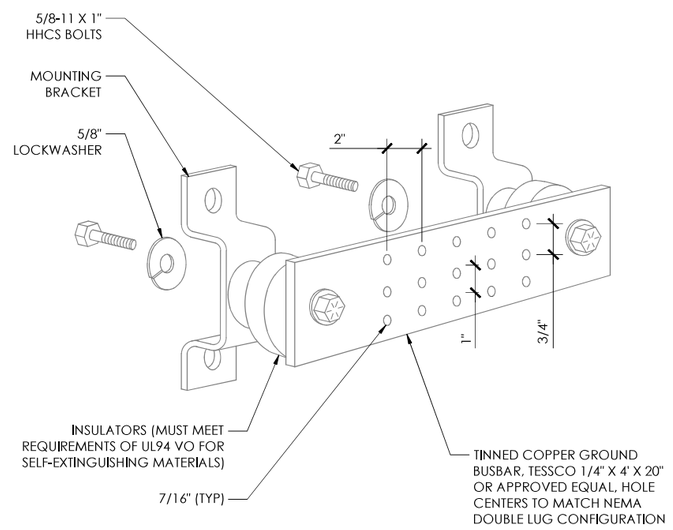
GROUNDING PLAN

SHEET NO.

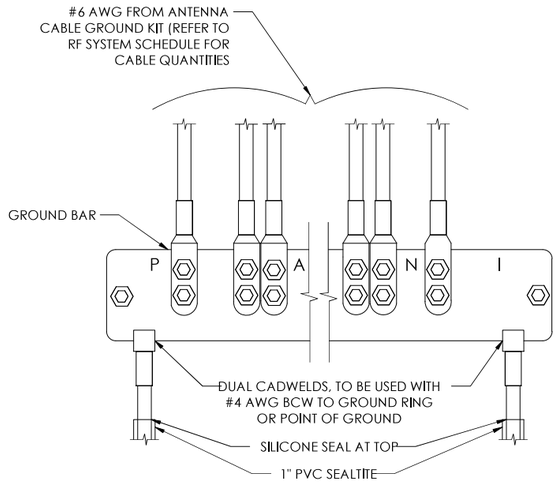
E3.0



1 SINGLE-LINE GROUNDING DIAGRAM — 11X17 SCALE: NTS — 22 x 34 SCALE: NTS



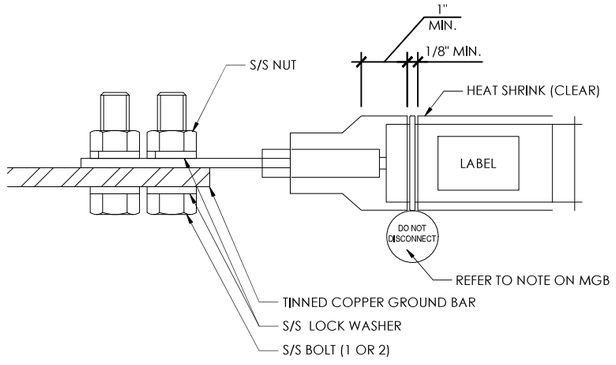
2 GROUND BAR — 11X17 SCALE: NTS — 22 x 34 SCALE: NTS



NOTES:

1. CONTRACTOR TO CONFORM TO THE LATEST VERIZON WIRELESS "PANI" STANDARDS.

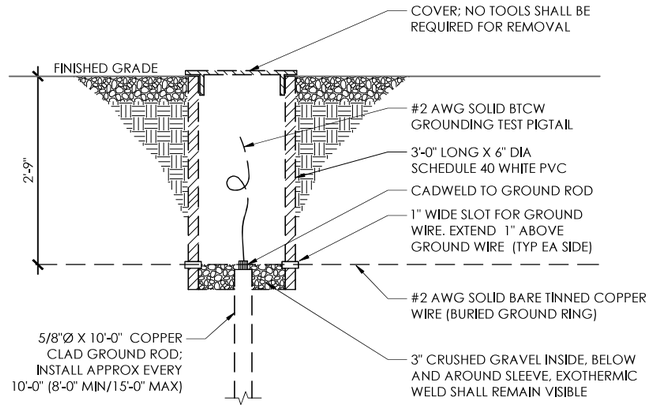
3 GROUND BAR TO GROUND WIRE — 11X17 SCALE: NTS — 22 x 34 SCALE: NTS



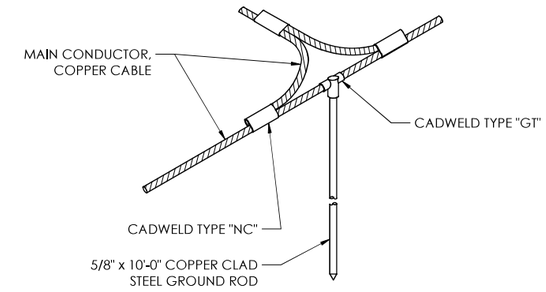
NOTES:

1. FOR GROUND BOND TO STEEL ONLY: INSERT A DRAGON TOOTH WASHER BETWEEN LUG AND STEEL, COAT ALL SURFACES WITH KOPR-SHIELD.
2. ALL HARDWARE 18/8 STAINLESS STEEL INCLUDING LOCK WASHER, COAT ALL SURFACES WITH KOPR-SHIELD BEFORE MATCHING.
3. PROVIDE 'DO NOT DISCONNECT' TAG.

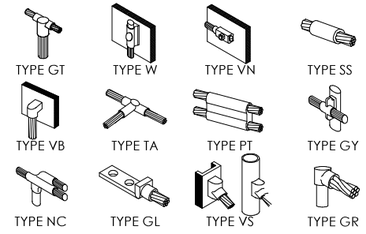
4 TYPICAL LUG — 11X17 SCALE: NTS — 22 x 34 SCALE: NTS



5 GROUND TEST WELL — 11X17 SCALE: NTS — 22 x 34 SCALE: NTS



TYPICAL CADWELD GROUNDING CONNECTIONS



6 GROUND RING / CADWELD CONN — 11X17 SCALE: NTS — 22 x 34 SCALE: NTS

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DRAWING VERSION

VER.	DATE	DESCRIPTION
1	01/16/25	PRELIM CONST DRAWINGS

LICENSER

PROJECT INFORMATION

MOSSYROCK

262 SKYVIEW DR
MOSSYROCK, WA 98564

SHEET TITLE

GROUNDING DETAILS

SHEET NO.

E4.0

1. ELECTRICAL CONTRACTOR SHALL SUPPLY AND INSTALL ANY/ALL ELECTRICAL WORK INDICATED. ANY/ALL CONSTRUCTION SHALL BE IN ACCORDANCE W/DRAWINGS AND ANY/ALL APPLICABLE SPECIFICATIONS. IF ANY PROBLEMS ARE ENCOUNTERED BY COMPLYING WITH THESE REQUIREMENTS, CONTRACTOR SHALL NOTIFY VZW CONSTRUCTION MANAGER AS SOON AS POSSIBLE AND SHALL NOT PROCEED WITH THAT PORTION OF WORK, UNTIL THE CONSTRUCTION MANAGER HAS DIRECTED THE CORRECTIVE ACTIONS TO BE TAKEN.

2. ELECTRICAL CONTRACTOR SHALL VISIT THE JOB SITE AND FAMILIARIZE HIMSELF WITH ANY/ALL CONDITIONS AFFECTING THE INSTALLATION OF PROPOSED ELECTRICAL AND COMMUNICATION CIRUITS AND EQUIPMENT AND SHALL MAKE PROVISIONS FOR THE COST THEREOF. ALL EXISTING CONDITIONS OF EXISTING ELECTRICAL EQUIP., LIGHT FIXTURES, ETC. IF ANY, THAT ARE PART OF THE FINAL SYSTEM, SHALL BE VERIFIED BY THE CONTRACTOR, PRIOR TO THE SUBMITTAL OF HIS BID. FAILURE TO COMPLY WITH THIS PARAGRAPH WILL IN NO WAY RELIEVE CONTRACTOR OF PERFORMING ALL WORK NECESSARY FOR A COMPLETE AND WORKING SYSTEM.

3. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE LATEST EDITION OF THE NEC AS ADOPTED BY THE LOCAL AHJ AS WELL AS ALL LOCAL CODES AND ORDINANCES OF THE LOCAL AUTHORITY HAVING JURISDICTION. THIS WORK SHALL BE GOVERNED BY :

   A. UL -- UNDERWRITERS LABORATORIES
   B. NEC -- NATIONAL ELECTRICAL CODE
   C. NEMA -- NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION STANDARDS
   D. OSHA -- REQUIREMENTS OF THE OCCUPATIONAL SAFETY AND HEALTH ACT
   E. IBC -- INTERNATIONAL BUILDING CODE
   F. NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION
   G. IEEE - INSTITUTE OF ELECTRICAL & ELECTRONICS ENGINEERS STANDARDS

4. DO NOT SCALE ELECTRICAL DRAWINGS, REFER TO DIMENSIONED SITE PLANS AND ELEVATIONS FOR EXACT LOCATIONS OF ALL EQUIPMENT AND CONFIRM WITH CONSTRUCTION MANAGER ANY SIZES AND LOCATIONS WHEN UNCLEAR.

5. EXISTING SERVICES: CONTRACTOR SHALL NOT INTERRUPT EXISTING UTILITY SERVICES WITHOUT WRITTEN PERMISSION OF PROPERTY OWNERS.

6. CONTRACTOR SHALL PAY FOR ANY/ALL PERMITS, FEES, INSPECTIONS AND TESTING. CONTRACTOR SHALL OBTAIN PERMITS AND APPROVED SUBMITTALS PRIOR TO ORDERING EQUIPMENT OR STARTING THE WORK.

7. THE TERM "PROVIDE" USED IN CONSTRUCTION DOCUMENTS AND SPECIFICATIONS SHALL BE UNDERSTOOD TO MEAN THAT THE CONTRACTOR SHALL FURNISH, INSTALL AND CONNECT.

8. CONTRACTOR SHALL CONFIRM WITH LOCAL ELECTRIC UTILITY COMPANY ANY/ALL REQUIREMENTS, INCLUDING BUT NOT LIMITED TO: LUG SIZE RESTRICTIONS, CONDUIT ENTRY, SIZE OF TRANSFORMERS, SCHEDULED DOWNTIME FOR THE OWNERS' CONFIRMATION, ETC. ANY/ALL CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE CONSTRUCTION MANAGER PRIOR TO BEGINNING ANY WORK.

9. MINIMUM WIRE SIZE SHALL BE #12 AWG, NOT INCLUDING CONTROL WIRING, UNLESS NOTED OTHERWISE. ALL CONDUCTORS SHALL BE COPPER WITH XHHW-2 INSULATION.

10. OUTLET BOXES SHALL BE CAST ALLOY WITH THREADED HUBS IN WET/DAMP LOCATIONS AND SPECIAL ENCLOSURES FOR OTHER CLASSIFIED AREAS AS SHOWN ON THE DRAWINGS.

11. IT IS NOT THE INTENT OF THESE PLANS TO SHOW EVERY MINOR DETAIL OF THE CONSTRUCTION. CONTRACTOR IS EXPECTED TO FURNISH AND INSTALL ALL ITEMS FOR A COMPLETE ELECTRICAL SYSTEM AND PROVIDE ALL REQUIREMENTS FOR THE EQUIPMENT TO BE PLACED IN PROPER WORKING ORDER.

12. ELECTRICAL SYSTEM SHALL BE AS COMPLETELY AND EFFECTIVELY GROUNDED AS REQUIRED BY SPECIFICATIONS SET FORTH BY VERIZON WIRELESS.

13. ALL WORK SHALL BE PERFORMED BY A LICENSED ELECTRICAL CONTRACTOR IN A FIRST CLASS, WORKMANLIKE MANNER. THE COMPLETED SYSTEM SHALL BE FULLY OPERATIVE AND SUBJECT TO REGULATORY INSPECTION AND APPROVAL BY CONSTRUCTION MANAGER.

14. ALL WORK SHALL BE COORDINATED WITH OTHER TRADES TO AVOID INTERFERENCE WITH THE PROGRESS OF CONSTRUCTION.

15. CONTRACTOR SHALL GUARANTEE ANY/ALL MATERIALS AND WORK FREE FROM DEFECTS FOR A PERIOD OF NOT LESS THAN TWO YEAR FROM DATE OF CUSTOMER'S ACCEPTANCE.

16. THE CORRECTION OF ANY DEFECTS SHALL BE COMPLETED WITHOUT ANY ADDITIONAL CHARGE WITHIN 48 HOURSOF NOTICE AND SHALL INCLUDE THE REPLACEMENT OR THE REPAIR OF ANY OTHER PHASE OF THE INSTALLATION WHICH MAY HAVE BEEN DAMAGED THEREIN.

17. ADEQUATE AND REQUIRED LIABILITY INSURANCE SHALL BE PROVIDED BY THE CONTRACTOR FOR PROTECTION AGAINST PUBLIC LOSS AND ANY/ALL PROPERTY DAMAGE FOR THE DURATION OF WORK.

18. PROVIDE AND INSTALL CONDUIT, CONDUCTORS, PULL WIRES, BOXES, COVER PLATES AND DEVICES FOR ALL OUTLETS AS INDICATED.

19. DITCHING AND BACK FILL: CONTRACTOR SHALL PROVIDE FOR ALL UNDERGROUND INSTALLED CONDUIT AND/OR CABLES INCLUDING EXCAVATION, BACKFILLING, COMPACTION AND REPAIR OF SURFACE TO ORIGINAL CONDITION. REFER TO DRAWING DETAIL AS WELL AS NOTES AND REQUIREMENTS: EXCAVATION, AND BACKFILLING.

20. MATERIALS, PRODUCTS AND EQUIPMENT, INCLUDING ALL COMPONENTS THEREOF, SHALL BE NEW, SHALL APPEAR ON THE LIST OF U.L. APPROVED ITEMS AND SHALL MEET OR EXCEED THE REQUIREMENTS OF THE NEC, NEMA AND IEEE.

21. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OR MANUFACTURES CATALOG INFORMATION OF LIGHTING FIXTURES,TIMER SWITCHES AND ALL OTHER ELECTRICAL ITEMS PRIOR TO INSTALLATION FOR APPROVAL BY THE CONSTRUCTION MANAGER.

22. ANY CUTTING OR PATCHING DEEMED NECESSARY FOR ELECTRICAL WORK SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTORS, SHALL BE INCLUDED IN THE PROPOSED PRICE FOR THE WORK AND SHALL BE PERFORMED TO THE SATISFACTION OF THE CONSTRUCTION MANAGER FOR FINAL ACCEPTANCE.

23. THE ELECTRICAL CONTRACTOR SHALL LABEL ALL PANELS WITH ONLY TYPEWRITTEN DIRECTORIES. ALL ELECTRICAL WIRING SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR.

24. DISCONNECT SWITCHES REQUIRED SHALL BE H.P. RATED HEAVY-DUTY, QUICK-MAKE AND QUICK-BREAK ENCLOSURES, AS REQUIRED BY EXPOSURE TYPE.

25. ALL CONNECTIONS SHALL BE MADE WITH A PROTECTIVE COATING OF AN ANTI-OXIDE COMPOUND SUCH AS "NO-OXIDE A" BY DEARBORNE CHEMICAL CO. COAT ALL WIRE SURFACES BEFORE CONNECTING. EXPOSED COPPER SURFACES, INCLUDING GROUND BARS, SHALL BE TREATED - NO SUBSTITUTIONS.

26. RACEWAYS: CONDUIT SHALL BE SCHEDULE 40 PVC MEETING OR EXCEEDING NEMA TC2 - 1990 OR OTHERWISE AS SHOWN ON DRAWINGS. CONTRACTOR SHALL PLUG AND CAP EACH END OF SPARE AND EMPTY CONDUITS AND PROVIDE TWO SEPARATE PULLTAPES - 200 LBS TEST POLYETHYLENE CORD. ALL CONDUIT BENDS SHALL BE A MINIMUM OF 2 FT. RADIUS. RGS CONDUITS WHEN SPECIFIED, SHALL MEET UL-6 FOR GALVANIZED STEEL. ALL FITTINGS SHALL BE SUITABLE FOR USE WITH THREADED RIGID CONDUIT. COAT ALL THREADS WITH 'BRITE ZINC' OR 'GOLD CALV'.

27. SUPPORT OF ALL ELECTRICAL WORK SHALL BE AS REQUIRED BY NEC.

28. CONDUCTORS: CONTRACTOR SHALL USE 98% CONDUCTIVITY COPPER WITH TYPE XHHW-2 INSULATION, 600 VOLT, COLOR CODED. USE SOLID CONDUCTORS FOR WIRE UP TO AND INCLUDING NO. 8 AWG. USE STRANDED CONDUCTORS FOR WIRE LARGER THAN NO. 8 AWG.

29. CONNECTORS FOR POWER CONDUCTORS: CONTRACTOR SHALL USE PRESSURE-TYPE INSULATED TWIST-ON CONNECTORS FOR NO. 10 AWG AND SMALLER. USE SOLDERLESS MECHANICAL TERMINAL LUGS FOR NO. 8 AWG AND LARGER.

30. SERVICE: 240/120V, SINGLE PHASE, 3 WIRE CONNECTIONS AVAILABLE FROM UTILITY COMPANY. OWNER OR OWNERS AGENT WILL APPLY FOR POWER.

31. TELEPHONE SERVICE: CONTRACTOR SHALL PROVIDE EMPTY CONDUITS WITH MULE TAPE AS INDICATED ON DRAWINGS.

32. ELECTRICAL AND TELCO RACEWAYS TO BE BURIED A MINIMUM OF 2' DEPTH.

33. CONTRACTOR SHALL PLACE TWO LENGTHS OF WARNING TAPE AT A DEPTH OF 12" BELOW GROUND AND DIRECTLY ABOVE ELECTRICAL AND TELCO SERVICE CONDUITS. CAUTIONS TAPE TO READ "CAUTION BURIED ELECTRIC" OR "BURIED TELECOM".

34. ALL BOLTS SHALL BE STAINLESS STEEL.

35. CONTRACTOR SHALL COORDINATE WITH LOCAL POWER COMPANY FOR REQUIREMENTS OF POWER SERVICE LATERAL TO THE METER BASE. POWER SERVICE REQUIREMENT IS COMMERCIAL. AC NOMINAL 120/208 VOLT OR 120/240 VOLT, SINGLE PHASE WITH 200 AMP RATING WHEN REQUIRED.

36. CONTRACTOR SHALL COORDINATE WITH LOCAL TELEPHONE COMPANY FOR FIBER OPTIC CABLE SERVICE REQUIREMENTS TO TERMINATE AS SHOWN ON DRAWINGS.

37. UNDERGROUND POWER AND TELCO SERVICE LINES SHALL BE ROUTED IN A COMMON TRENCH. ALL UNDERGROUND CONDUIT SHALL BE PVC SCHEDULE 40 AND CONDUIT EXPOSED ABOVE GROUND SHALL BE GALVANIZED RIGID STEEL TUBING UNLESS OTHERWISE INDICATED.

38. ALL FIBER OPTIC CABLE CONDUIT LINES SHALL BE 4" SCH. 40 PVC CONDUIT UNLESS OTHERWISE INDICATED. THE TELCO CONDUIT FROM THE PPC SHALL BE ROUTED AND TERMINATED AT DESIGNATED TELCO DEMARCATION OR 2-FEET OUTSIDE FENCED AREA, NEAR UTILITY POLE (IN FENCED AREA), OR END CAP OFF AND PROVIDE MARKER STAKE PAINTED BRIGHT ORANGE WITH DESIGNATION FOR TELCO SERVICE.

39. CONDUITS INSTALLED AT PCS EQUIPMENT ENDS PRIOR TO THE EQUIPMENT INSTALLATION SHALL BE STUBBED AND CAPPED AT 6" ABOVE GRADE OR PLATFORM. IF SERVICE LINES CAN'T BE INSTALLED INITIALLY, PROVIDE NYLON PULL CORD IN CONDUITS.

40. THE VERIZON WIRELESS PTLC, INCLUDING 200 AMP DUAL INTERLOCKING MAIN CIRCUIT BREAKERS 200A ATS, 200A LOADCENTER PANEL AND TELCO PANEL, SHALL BE PROVIDED BY OWNER AND INSTALLED BY THE CONTRACTOR. CONTRACTOR SHALL FURNISH AND INSTALL CIRCUIT BREAKER(S) NOT PROVIDED BY MANUFACTURER. SEE PANEL SCHEDULE IN THESE DRAIWNGS FOR CIRCUIT BREAKER REQUIREMENTS.

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PROJECT INFORMATION

MOSSYROCK

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SHEET TITLE

GENERAL ELECTRICAL NOTES

SHEET NO.

E5.0