APPENDIX A - SCOPING COMMENTS

MENDOCINO

Local Agency Formation Commission

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April 5, 2023

Dusty Duley, Community Development Director
City of Willits
111 East Commercial Street
Willits, CA 95490

Re: Notice of Preparation of a Draft Programmatic Environmental Impact Report for the City of Willits Land Use Element & Sphere of Influence Update

Dear Mr. Duley:

Thank you for the opportunity to review the Notice of Preparation of the Draft Programmatic Environmental Impact Report ("EIR") for the City of Willits Land Use Element & Sphere of Influence Update. As the lead agency, the City of Willits is responsible for considering the effects, both individual and collective, of all activities involved in the project. LAFCo, as a Responsible Agency, will use the CEQA document prepared by the City in reviewing the proposed sphere of influence ("Sphere" or "SOI") expansion or amendment.

As an initial matter, the Project Description does not identify the proposed Sphere expansion, and simply states that despite a projected decline in population, "various emerging local and regional factors indicate a need to provide for a range of housing types in Willits that can be readily developed." The Project Description for the EIR must include the project scope and details regarding the proposed Sphere expansion or amendment.

LAFCo's purposes are to (1) discourage urban sprawl, (2) preserve open space and prime agricultural land, (3) efficiently provide government services, and (4) encourage the orderly formation and development of local agencies, including cities (Government Code (GC) § 56301). Mendocino LAFCo has adopted local policies that it must consider when making decisions on proposed Sphere updates. The policies may be found at https://www.mendolafco.org/policies-procedures.

The following comments are provided for the City's consideration with respect to any expansion of or amendment to the existing Sphere and are necessarily general because of the lack of detail in the NOP.

Sphere of Influence Policies

Mendocino LAFCo's policies describe a Sphere of Influence as follows: "A sphere of influence is the probable 20-year growth boundary for a jurisdiction's physical development." State law and Mendocino LAFCo policies contain numerous provisions that are intended to prevent sprawl and encourage logical growth when considering Sphere expansions. The EIR should include a discussion regarding these policies (Mendocino LAFCo Policies & Procedures Manual, Policy 10.1), including those highlighted below:

- Development of existing vacant lands for urban uses within the jurisdictional boundaries of a local agency shall be encouraged before any annexation proposal or change to a sphere of influence is approved which would lead to, or allow, the development of prime agricultural or open space lands outside the existing jurisdiction of any local agency. (Policy 9.13)

  The EIR should identify and evaluate existing vacant land for urban uses within the existing City boundary.

- Territory not in need of urban services, including open space, agriculture, non-protested, or protested and not upheld Williamson Act contracted lands, is considered by LAFCo to be not appropriate for inclusion in an agency's sphere of influence, unless the area's exclusion would impede the planned orderly and efficient development of this area. (Policy 10.1.7)

- Prior to the Commission's consideration of a sphere of influence expansion request, the City must provide a plan for services including evidence that it has the service capacity and fiscal capability to adequately serve the subject territory. (Policy 9.3)

  The EIR should include an analysis of impacts to utilities and other services with respect to the proposed Sphere expansion or amendment.

1. **Clarify the area proposed for inclusion in the SOI and that is being analyzed in the Draft EIR.**
2. **Include a map depicting the existing and proposed SOI boundary.**
3. **The EIR Study Area should include all areas proposed for inclusion in the SOI for purposes of analysis, identification of potential impacts and mitigation measures.**
4. **Identify and describe any other service providers within the proposed SOI area, including special districts and private water companies.**

Municipal Service Review

The Cortese-Knox-Hertzberg Act (Govt. Code §56430) requires LAFCo to prepare a Municipal Service Review (MSR) for all local agencies within its jurisdiction (Mendocino LAFCo Policies & Procedures Manual, Policy 10.2). Sphere of influence changes initiated by any agency providing municipal services shall generally require either an updated or new service review unless LAFCo determines that a prior service review is adequate. The last MSR and SOI update for the City of Willits was adopted on May 6, 2019. It is anticipated that any updates to the MSR would be minimal and focused on the area proposed for inclusion in the SOI and significant changes since 2019. There is the potential for a comprehensive Plan for Services to serve as an MSR Update document.

City-County Meeting Requirement

An expansion of the Sphere triggers a requirement for City of Willits representatives to meet with the County to discuss the proposed sphere and explore methods to reach agreement on its boundaries, development standards, and zoning requirements within the Sphere. (Government Code Section 56425(b).) This must occur prior to application to LAFCo for a Sphere modification. If an agreement is reached, LAFCo is required to give great weight to that agreement in the consideration of any proposed sphere of influence. If no agreement is reached, an application may be submitted and the Commission shall consider a Sphere for the City consistent with the policies adopted by the Commission.

Regional Planning

The EIR should discuss how the proposal relates to overall regional planning for the area. Mendocino County is not located within a metropolitan planning organization boundary and therefore is not subject to the provisions of SB 375. However, the Mendocino Council of Governments ("MCOG") supports and coordinates the local planning efforts of Mendocino County and the Cities of Fort Bragg, Point Arena, Ukiah, and Willits to address regional housing and transportation needs and helps provide a framework for sustainable regional growth patterns through the 2018 Mendocino County Regional Housing Needs Allocation Plan and Vision Mendocino 2030 Blueprint Plan. MCOG is also responsible for allocating regional transportation funding to transportation improvement projects consistent with the 2017 Regional Transportation Plan for Mendocino County.

Mendocino County and the Cities of Fort Bragg, Point Arena, Ukiah, and Willits are the local agencies primarily responsible for planning regional growth patterns through adoption and implementation of general plan and zoning regulations. While Mendocino County is not subject to the provisions of SB 375, LAFCo will review applicable regional transportation and growth plans when considering a Sphere update application.

Agricultural Resources

One of LAFCo's primary directives, as described by the Legislature, is to protect and promote agriculture and open space lands. LAFCo's policies state that development should be guided away from agricultural lands, including prime agricultural land (Mendocino LAFCo Policies & Procedures Manual, Policy 9.13). The Project Description in the NOP should clearly describe and map the proposed Sphere, including the identification of agricultural zoned lands, those lands used for agricultural purposes, and any lands meeting the definitions of prime agricultural lands. The EIR's analysis of impacts to agricultural lands should describe not only those lands categorized on the Department of Conservation's Important Farmland Map, but also those lands that fall within the Cortese Knox Hertzberg Local Government Act of 2000 (CKH) definition of prime agricultural land (Government Code Section 56064). Please note that the CKH definition is significantly different from that of the Department of Conservation, and care should be taken to ensure that the CKH definition is included in the analysis for the EIR.

CALAFCO's White Paper *State of the Art on Agricultural Preservation* includes discussion of the differences in definitions of prime agricultural land and potential mitigation measures for agricultural preservation as it relates to LAFCo's guiding principles and goals specified in the CKH.

The EIR should evaluate loss of agricultural land in general, and prime agricultural land in particular. If agricultural land would be lost or otherwise impacted, the City should incorporate into the project description and evaluate in the EIR feasible mitigation measures that reduce the potential impacts to agricultural resources, including agricultural buffers that would minimize conflicts between agricultural and non-agricultural uses.

In order to address the loss of prime agricultural lands, the City, through its EIR, should consider various types of development options/alternatives aimed at increasing urban densities. These may include concepts incorporating walkable communities, mixed-use concepts, multi-story buildings, etc., in order to allow for higher overall residential densities—thus reducing the conversion of, and expansion onto, prime agricultural lands.

5. **Include discussion and analysis of impacts to agricultural lands as defined in GC § 56016 and 56064.**
6. **Identify, map, analyze, and describe all agricultural and open space lands within or adjacent to lands proposed for inclusion in the SOI, including analysis of any multiple land-based values such as agricultural, biodiversity, recreation, groundwater, and carbon sequestration, to identify areas of high natural resource value where development is best avoided.**
7. **Identify and analyze impacts to Williamson Act lands proposed for inclusion in the SOI.**
8. **Analyze the impact on the physical and economic integrity of impacted and surrounding agricultural lands.**
9. **Consider removal of excessive amounts of agricultural and open-space land from the SOI (i.e., where the SOI is much larger than what is needed over a long-range development horizon).**
10. **Develop policies that avoid, minimize and/or mitigate impacts to agricultural lands. See the CALAFCO White Paper *State of the Art on Agricultural Preservation* and the Mendocino County Sustainable Agricultural Lands Conservation Program for information on policies and programs for example avoidance, minimization and mitigation methods.**
11. **Include long-term growth management strategies that provide for more efficient development so as to avoid the premature conversion of agricultural lands and to limit development pressure on agricultural lands.**

12. **The City is encouraged to consider and include plans and policies for agricultural preservation. The City of Ukiah's recently adopted 2040 General Plan includes an Agriculture Element that may be of interest.**
13. **Identify mitigation measures to protect agricultural lands adjoining areas proposed for annexation and/or development, both to prevent premature conversion to non-agricultural uses and to minimize potential conflicts between proposed urban development and adjacent agricultural uses. Examples of feasible mitigation measures include: right-to-farm deed restrictions, setbacks and buffers, and conservation easements on a 1:1, 2:1 or 3:1 ratio.**
14. **Include analysis of alternatives that do not result in conversion of agricultural lands as defined in the CKH. Examples of potential project alternatives to reduce impacts to agricultural lands include, among others: reduced footprint, clustered density, setbacks and buffers.**
15. **The Draft EIR should demonstrate that infill or more efficient use of land is not possible prior to considering development, SOI expansion and/or annexation into agricultural lands.**

Public Facilities, Services, and Infrastructure

LAFCo is concerned with the potential impact of planned growth on public services and infrastructure, including the topic areas of hydrology and water quality, public services, parks and recreation, utilities and service systems. Typically, master plans are prepared for sewer, water and stormwater utilities, and the EIR should also evaluate the need for increased police, fire, parks and recreation staff, and essential services (water, sewer, roads) resulting from the growth contemplated in the General Plan.

16. **The Draft EIR should evaluate the need for increased police, fire, parks and recreation staff, and essential services (water, sewer, roads) resulting from the growth contemplated in the General Plan.**

Disadvantaged Unincorporated Communities

SOI updates of a city that provides public facilities or services related to sewers, municipal and industrial water, or structural fire protection, need to address the present and probable need for those public facilities and services of any disadvantaged unincorporated communities (DUCs) within the SOI (GC § 56425(e)(5)). DUCs are defined in GC § 56033.5.

17. **Identify, locate and describe all disadvantaged unincorporated communities (DUCs) within and contiguous to the proposed SOI (GC § 56430(a)(2 and 3)).**

Prezoning within Proposed SOI

In reviewing proposals for annexation, the CKH requires the commission to include a condition that a city prezone the territory to be annexed or present evidence satisfactory to the commission that the existing development entitlements on the territory are vested or are already at build-out, and are consistent with the city's general plan (GC § 56375(a)(4)(A)(7)). Areas proposed for annexation must be located within an agency's SOI.

18. **The City should consider prezoning the area within the proposed SOI to streamline future annexations submitted for commission consideration. In doing so at this stage, the prezoning may be analyzed in the Draft EIR.**

General CEQA Considerations

LAFCo would prefer to rely upon the SOI amendment analysis in the City's EIR to avoid piecemealing as well as additional expense associated with a preparation of a separate CEQA document. With the SOI amendment included in the Draft EIR, LAFCo will be a Responsible Agency for purposes of CEQA.

19. **Clarify that LAFCO is a Responsible Agency as it relates to the EIR and indicate the types of LAFCo approvals that the City anticipates seeking. We also suggest that a section be included in the Draft EIR briefly identifying all Responsible Agencies for the Program EIR and providing brief information on the types of approvals or permits that the City anticipates seeking from the identified agencies.**
20. **CKH, California Government Code, Section 56377: In reviewing and approving or disapproving proposals which could reasonably be expected to induce, facilitate, or lead to the conversion of existing open-space lands to uses other than open-space uses, the commission shall consider...(a) Development or use of land for other than open-space uses shall be guided away from existing prime agricultural lands in open-space use toward areas containing nonprime agricultural lands, unless that action would not promote the planned, orderly, efficient development of an area.**
21. **CEQA Guidelines, Title 14, California Code Regulations, Section 15041: The responsible agency may require changes in a project to lessen or avoid only the effects, either direct or indirect, of that part of the project which the agency will be called on to carry out or approve.**
22. **CEQA Guidelines, Title 14, California Code Regulations, Section 15096(g)(2): When an EIR has been prepared for a project, the Responsible Agency shall not approve the project as proposed if the agency finds any feasible alternative or feasible mitigation measures within its powers that would substantially lessen or avoid any significant effect the project would have on the environment. With respect to a project which includes housing development, the Responsible Agency shall not reduce the proposed number of housing units as a mitigation measure if it determines that there is another feasible specific mitigation measure available that will provide a comparable level of mitigation.**

Additional Comments

Mendocino LAFCo encourages prospective applicants to meet with LAFCo staff early in the planning process. We find that such consultation and on-going communication is helpful to clarify the nuances of LAFCo requirements and to avoid delays later in the process. If you have any questions, please contact me at (707) 463-4470 or eo@mendolafco.org.

LAFCo staff requests to be notified when the Draft EIR is available for review, and will provide further comments at that time, if necessary.

Thank you for the opportunity to provide initial comments as the City undertakes the preparation of the EIR for the referenced project.

Sincerely,

Uma Hinman
Executive Officer

cc: Commissioners

State of California - Natural Resources Agency
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GAVIN NEWSOM, *Governor*
CHARLTON H. BONHAM, *Director*

April 10, 2023

Dusty Duley
City of Willits
111 E. Commercial Street
Willits, CA 95490
DDuley@cityofwillits.org

SUBJECT: City of Willits Land Use Element & Sphere of Influence Update Project NOP - Notice of Preparation of a Programmatic Environmental Impact Report (SCH#2023030321)

Dear Dusty Duley:

The California Department of Fish and Wildlife (CDFW) has reviewed the Notice of Preparation (NOP) for the above-referenced project (Project) dated March 10, 2023. The Programmatic Environmental Impact Report (PEIR) will address the environmental impacts associated with the adoption and implementation of the proposed Project and the zoning amendments necessary to implement the City of Willits' (City) General Plan, as well as planning for an expansion of its Sphere of Influence (SOI). CDFW appreciates this opportunity to comment on the scope and content of the Project, relative to public trust resources and impacts upon them.

The Project will update and amend the City's existing General Plan Land Use Element, which was last updated in 1992, and address the goals, policies, and implementation programs that will guide the City's long-term physical and economic development. The Land Use Element will include the general distribution, location, and extent of the uses for housing, business, industry, open space, agriculture, natural resources, and recreation and its Planning Area will include land outside of the City's boundaries. The proposed Project will require zoning amendments to implement the Land Use Element and SOI update.

As the Trustee for the State's fish and wildlife resources, CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary to sustain their populations. As a Responsible Agency, CDFW administers the California Endangered Species Act and other provisions of the Fish and Game Code (FGC) that conserve the State's fish and wildlife public trust resources. CDFW offers the following comments and recommendations in our role as Trustee and Responsible Agency pursuant to the California Environmental Quality Act (CEQA; California Public Resource Code §21000 *et seq*.). CDFW participates in the regulatory process in its roles as Trustee and Responsible Agency to minimize the Project impacts and avoid potential significant environmental impacts by recommending avoidance and minimization measures. These comments are intended to reduce the Project's impacts on public trust resources.

Comments and Recommendations

The NOP states the implementation of the Land Use Element may have a significant effect on the environment, which may include direct and indirect impacts from development, as well as cumulative impacts. The PEIR will disclose potential impacts of the proposed Project, and propose mitigation measures to avoid and/or reduce impacts deemed potentially significant. CDFW has reviewed the Land Use Element in the City's current Vision 2020 General Plan (1992). CDFW has also reviewed the goals and policies of the current General Plan, and recommends the City expand them to provide further protection for natural resources.

Recommendation 1: CDFW encourages the City to develop additional goals and policies, and incorporate protective measures and implementing programs that would avoid or minimize potential impacts to natural resources including riparian areas and streams, wetlands, sensitive natural communities, rare and endangered plant species; protect native trees and natural communities including oaks and oak woodlands; and encourage invasive species removal and landscaping with locally native plant species.

<u>Riparian, Stream and Wetland Protection Zones and Setbacks</u>

Riparian corridors, streams, and wetlands provide vital habitat for the majority of plant and wildlife species (CDFW 2014), and riparian areas are important foraging and movement corridors for wildlife.

The City of Willits should consider strengthened protection of wetlands through establishment of no-net-loss wetland policies, and requiring biological scoping or assessment as condition of approval for proposed projects adjacent to wetlands, riparian areas, and streams. These protections could be accomplished through adoption of programs containing specific implementation plans. One local example includes the City of Ukiah General Plan 2040, which includes the establishment of a Creek and Stream Protection Zone implementing program which identifies minimum buffers and extended buffers in areas with riparian habitat and wetlands. Additionally, the City of Ukiah update includes an Erosion Prevention Program, which will help avoid potential impacts to streams through erosion and sedimentation.

Recommendation 2: Develop a wetland and stream protection zone as part of the updated zoning amendments to provide adequate disturbance buffers for riparian areas, streams, and wetlands. CDFW recommends that minimum buffer distances are measured from the top of the stream bank or the edge of the riparian drip-line, whichever is greater, on either side of perennial and intermittent streams. For wetlands, CDFW recommends a minimum setback to be measured from the delineated edge of the wetland.

Conservation of Oaks and Oak Woodlands

In California, oak woodlands have the greatest wildlife species richness of any other habitat in the state with over 330 species of amphibians, birds, and mammals relying upon these habitats at some point during their lives (CalPIF 2002). Oak woodlands have experienced ongoing declines due to conversion for agricultural uses, and oak woodlands are also impacted by low recruitment, competition from invasive species, and fire suppression (Whipple et al. 2011). California has lost approximately 1/3 of its historic oak woodland habitat statewide (CalPIF 2002). Because oaks are slow-growing trees, the substantial habitat and ecosystem value that mature trees provide is difficult to replace.

Recommendation 3: Develop an oak tree and oak woodland retention and protection policy and implementing program for new development that emphasizes the avoidance or minimization of oak tree and oak woodlands removal.

Invasive Species Control and Native Plant Landscaping

The predominance of non-native ornamental and invasive plant species in landscaping are generally not water-wise options (Valliere et al. 2019) and provide little habitat or food foraging opportunities for native wildlife including insects and bird species (Myjer 2019, Narango et al. 2017). Since 2013, the City of Fort Bragg and the City of Ukiah have each updated their General Plan elements to include new goals, policies, and implementation programs that encourage local, native plant landscape planting, retaining native trees, and removal of invasive plant species.

The City of Fort Bragg’s General Plan Goals and Policies encourage native plants and discourage planting or retaining non-native, invasive plants and trees. Their policies condition development to require that 50% of all plantings are native plants, and requires discretionary development projects to prohibit the planting of any species of broom, pampas grass, gorse, or other species of invasive non-native plants deemed undesirable by the City. Their policies also conditionally require site planning, construction, and maintenance to preserve existing healthy trees and native vegetation on the site.

The City of Ukiah's 2040 General Plan update includes a program to develop an Urban Forest Master Plan that includes the types of trees appropriate for Ukiah and locations where the City would receive the greatest benefits from new trees, including trees within commercial and residential areas, as well as city parks and facilities.

Recommendation 4: Encourage the use of locally native plants for landscaping, encourage the removal of non-native invasive plant species where feasible, and prohibit the planting of any plant or tree species in new development that are (a) listed as problematic and/or invasive by the California Invasive Plant Council, and/or by the State of California, or (b) listed as a "noxious weed" by the California Department of Food and Agriculture (CDFA 2023).

CDFW looks forward to reviewing the draft PEIR and is available for consultation. Should the City have any questions or concerns, please contact Senior Environmental Scientist Specialist Jennifer Garrison; (707) 477-7792.

Sincerely,

DocuSigned by:
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Rebecca Garwood
Environmental Program Manager
Northern Region Coastal

ec: State Clearinghouse, Office of Planning and Research
state.clearinghouse@opr.ca.gov

Rebecca Garwood, Angela Liebenberg, Jennifer Garrison
California Department of Fish and Wildlife

References:

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GOVERNOR'S OFFICE OF PLANNING AND RESEARCH
Apr 11 2023
STATE OF CALIFORNIA

April 10, 2023

1-MEN-Willits-General
Land Use & Sphere of Influence NOP
SCH# 2023030321

Mr. Dusty Duley, Director
Community Development Department
City of Willits
111 E. Commercial Street
Willits, CA 95490

Dear Mr. Duley:

Thank you for giving Caltrans the opportunity to comment on the Notice of Preparation (NOP) of a Programmatic Environmental Impact Report (Program EIR) for the City of Willits Land Use and Sphere of Influence Update. The City will evaluate the environmental effects associated with the proposed General Plan Land Use Element and Sphere of Influence (SOI) Updates. The Program EIR will address the environmental impacts associated with the adoption and implementation of the proposed project and the zoning amendments necessary to implement the General Plan as well as planning for an expansion of the City of Willits SOI. We have the following comments:

Caltrans encourages the City to consider the need for transportation infrastructure and future road network expansion with the proposed changes in land use and in the siting of proposed housing opportunity zones. We recommend that that the plan updates consider the connectivity of these new zones to the community's existing services, retail, employment, etc., from the perspective of the bicyclist and the pedestrian who will come to live in these zones.

When streamlining the housing approval process be sure to consider special roadblocks which may exist for infill or redevelopment proposals, which can make them less attractive to build than greenfield (vacant or raw land) development. Infill development is typically located closer to existing services, which can result in lower numbers of Vehicle Miles Traveled (VMT) generated by development, thereby lowering transportation impacts under CEQA. Infill is also generally regarded to require less investment in new infrastructure, e.g. utility lines and roads, than will greenfield development. Ideally, new policies should streamline infill development to make it as simple and inexpensive to approve as greenfield development.

By planning for land uses that generate fewer Vehicle Miles Traveled per capita, fewer Greenhouse Gas emissions will be produced from transportation sources. For the City's benefit, we have included a link to the California Air Pollution Control Officers Association (CAPCOA)'s "Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity." Chapter 3 contains a section on land use and neighborhood design measures that reduce Greenhouse Gas emissions from transportation sources. We request that Willits consider incorporating as many measures as is feasible into the Land Use and Sphere of Influence updates:
<https://www.caleemod.com/documents/handbook/full_handbook.pdf>.

Please contact me with questions or for further assistance at: (707) 684-6879 or by email at: <jesse.robertson@dot.ca.gov>.

Sincerely,

Jesse G. Robertson

Jesse Robertson
Transportation Planning
Caltrans District 1

c: State Clearinghouse

NATIVE AMERICAN HERITAGE COMMISSION

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Governor's Office of Planning & Research

March 17 2023

STATE CLEARING HOUSE

March 13, 2023

Dusty Duley
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Re: 2023030321, City of Willits Land Use Element & Sphere of Influence Updates Project, Mendocino County

Dear Mr. Duley:

The Native American Heritage Commission (NAHC) has received the Notice of Preparation (NOP), Draft Environmental Impact Report (DEIR) or Early Consultation for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code §21000 et seq.), specifically Public Resources Code §21084.1, states that a project that may cause a substantial adverse change in the significance of a historical resource, is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, §15064.5 (b) (CEQA Guidelines §15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an Environmental Impact Report (EIR) shall be prepared. (Pub. Resources Code §21080 (d); Cal. Code Regs., tit. 14, § 5064 subd.(a)(1) (CEQA Guidelines §15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources within the area of potential effect (APE).

CEQA was amended significantly in 2014. Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a separate category of cultural resources, "tribal cultural resources" (Pub. Resources Code §21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment. (Pub. Resources Code §21084.2). Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code §21084.3 (a)). **AB 52 applies to any project for which a notice of preparation, a notice of negative declaration, or a mitigated negative declaration is filed on or after July 1, 2015.** If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). **Both SB 18 and AB 52 have tribal consultation requirements**. If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. §800 et seq.) may also apply.

The NAHC recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments.

Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws.

AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a lead agency shall provide formal notification to a designated contact of, or tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:

- **a.** A brief description of the project.
- **b.** The lead agency contact information.
- **c.** Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code §21080.3.1 (d)).
- **d.** A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code §21073).

2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A lead agency shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code §21080.3.1, subds. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or Environmental Impact Report. (Pub. Resources Code §21080.3.1(b)).

- **a.** For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code §65352.4 (SB 18). (Pub. Resources Code §21080.3.1 (b)).

3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:

- **a.** Alternatives to the project**.**
- **b.** Recommended mitigation measures**.**
- **c.** Significant effects**.** (Pub. Resources Code §21080.3.2 (a)).

4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:

- **a.** Type of environmental review necessary.
- **b.** Significance of the tribal cultural resources.
- **c.** Significance of the project's impacts on tribal cultural resources.
- **d.** If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code §21080.3.2 (a)).

5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code §6254 (r) and §6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code §21082.3 (c)(1)).

6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:

- **a.** Whether the proposed project has a significant impact on an identified tribal cultural resource.
- **b.** Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code §21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code §21082.3 (b)).

7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:

a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or

b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code §21080.3.2 (b)).

8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code §21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code §21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code §21082.3 (a)).

9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code §21084.3 (b). (Pub. Resources Code §21082.3 (e)).

10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:

a. Avoidance and preservation of the resources in place, including, but not limited to**:**

i. Planning and construction to avoid the resources and protect the cultural and natural context.

ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.

b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:

i. Protecting the cultural character and integrity of the resource.

ii. Protecting the traditional use of the resource.

iii. Protecting the confidentiality of the resource.

c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.

d. Protecting the resource. (Pub. Resource Code §21084.3 (b)).

e. Please note that a federally recognized California Native American tribe or a non-federally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code §815.3 (c)).

f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code §5097.991).

11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An Environmental Impact Report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:

a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code §21080.3.1 and §21080.3.2 and concluded pursuant to Public Resources Code §21080.3.2.

b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.

c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code §21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code §21082.3 (d)).

SB 18

SB 18 applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. (Gov. Code §65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf.

Some of SB 18's provisions include:

1. Tribal Consultation: If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.** (Gov. Code §65352.3 (a)(2)).
2. No Statutory Time Limit on SB 18 Tribal Consultation. There is no statutory time limit on SB 18 tribal consultation.
3. Confidentiality: Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code §65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code §5097.9 and §5097.993 that are within the city's or county's jurisdiction. (Gov. Code §65352.3 (b)).
4. Conclusion of SB 18 Tribal Consultation: Consultation should be concluded at the point in which:
- **a.** The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
- **b.** Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/.

NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center (https://ohp.parks.ca.gov/?page_id=30331) for an archaeological records search. The records search will determine:
- **a.** If part or all of the APE has been previously surveyed for cultural resources.
- **b.** If any known cultural resources have already been recorded on or adjacent to the APE.
- **c.** If the probability is low, moderate, or high that cultural resources are located in the APE.
- **d.** If a survey is required to determine whether previously unrecorded cultural resources are present.

2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
- **a.** The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
- **b.** The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

3. Contact the NAHC for:

a. A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.

b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.

4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.

a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, §15064.5(f) (CEQA Guidelines §15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.

b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.

c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code §7050.5, Public Resources Code §5097.98, and Cal. Code Regs., tit. 14, §15064.5, subdivisions (d) and (e) (CEQA Guidelines §15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

If you have any questions or need additional information, please contact me at my email address: Cameron.Vela@nahc.ca.gov.

Sincerely,

Cameron Vela

Cameron Vela
Cultural Resources Analyst

cc: State Clearinghouse

APPENDIX B - BIOLOGICAL RESOURCES

Appendix A, Table 1. Special Status Fish and Wildlife Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each category, taxa are listed alphabetical order. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

	Conservation Status Listing and Rank						
Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Mollusks							
Anodonta californiensis (= *Anodonta nuttalliana* [Bieler 2015]) (California Floater)	NA	NA	NA	G3Q	S2?	Generally in shallow water, freshwater lakes and slow-moving streams and rivers with mud or sand substrates; typically found under submerged logs and vegetation. Reaches sexual maturity at 4–5 years and may live 10–15 years. Somewhat tolerant of lower dissolved oxygen and higher nutrient concentrations. Like other freshwater mussels, they require suitable host fish to complete life cycle. Taxonomy under review. Threats: Stream diversions, in-stream construction, in-stream barriers affecting host fish species, pollution and water quality degradation, competition from invasive aquatic invertebrates, and climate change.	Nearest documented occurrence records indicate presence (only at the quad-level) within the adjacent Foster Mountain 7.5-min. USGS quad to the east of the Planning Area and in the Tan Oak Park quad north of Laytonville (CNDDB 2023). Additional ["research grade"] occurrence reports also exist from the Tomki Creek watershed, north of the Planning Area (iNaturalist 2023). Potentially suitable habitat does occur within the Planning Area, including within the incorporated City limits and the proposed expanded SOI. Such habitat primarily consists of stream channels and any associated in-stream impoundments.
Insects							
Bombus caliginosus (Obscure Bumble Bee)	NA	NA	NA	G2G3	S1S2	Grassy coastal areas (including coast range mountains) or shrublands from Santa Barbara county, CA north to southern British Columbia, with some records from California's Central Valley (CNDDB 2023, Xerces Society 2023). Queens overwinter underground and emerge in early spring to mate and nest underground or occasionally above ground in abandoned bird nests, grass tufts, or other similar cavities. Food plant genera include *Baccharis*, *Ceanothus*, *Cirsium*, *Grindelia*, *Keckiella*, *Lathyrus*, *Lotus*, *Lupinus*, *Phacelia*., *Rubus*, *Trifolium*, etc. (Williams et al. 2014; etc.). Threats: Development, pesticides, pollution, some agricultural practices, wildfire, and climate change.	Nearest documented occurrence records indicate historic collections from near Ryan Creek just north of the Planning Area and Longvale, ~6 miles north of the Planning Area (CNDDB 2023). Well-drained upland grassland habitats and shrublands throughout the Planning Area, including the proposed expanded SOI, and to a lesser extent the within the incorporated City limits, provide suitable nesting and overwintering habitat for this species. During the blooming season, abundant foraging habitat also occurs throughout the Planning Area.

Appendix A, Table 1. Special Status Fish and Wildlife Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each category, taxa are listed alphabetical order. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Bombus occidentalis (Western Bumble Bee)	NA	SCE	NA	G3	S1	Once common and widespread, this species has declined precipitously (~40%) from central CA to southern British Columbia, possibly due (in part) to disease. Listed as "imperiled" by the Xerces Society (2023). Generalist foragers, often in open grassy areas, urban/parklands, chaparral/shrub lands and mountain meadows. Queens overwinter underground and emerge between mid-March and mid-April to mate and nest. Nesting habitat typically consists of well-drained grasslands with cavities and holes, such as those created by burrowing rodents (Mesler pers. comm.). Threats: Development, pesticides, pollution, some agricultural practices, wildfire, disease, and climate change.	Two (2) documented occurrences within the Planning Area: one (1) overlaps both the existing incorporated City limits and that of the proposed expanded SOI and another overlaps the northern extent of the Planning Area in the vicinity of Ryan Creek (CNDDB 2023). Well-drained upland grassland habitats with abundant rodent burrows occur throughout the Planning Area, including the proposed expanded SOI, and to a lesser extent the within the incorporated City limits, and provide suitable nesting and overwintering habitat for this species. During the blooming season, abundant foraging habitat also occurs throughout the Planning Area.
Danaus plexippus plexippus (Pop. 1) (Western Monarch)	FC	NA	NA	G4T1T2Q	S2	Monarchs reproduce and disperse in spring and summer, producing multiple generations, whose adults only live for 2–6 weeks. In this region, egg-laying and caterpillar development only occur on milkweed (*Asclepias* spp.). Adults migrating to overwintering sites in autumn enter non-breeding diapause and live throughout the winter (~6–9 months). Migratory routes typically follow river systems and associated riparian corridors and the species overwinters from (late September) October through late February–March in dense groups in trees at low-elevation, humid coastal sites protected from freezing from Mendocino County, California south to Baja California (Mexico). In recent years, however, this overwintering range has contracted and occupancy at latitudinal extremes of their historic overwintering range has become rare. Threats: Loss of milkweed (*Asclepias* spp.) breeding habitat due in large part to widespread and indiscriminate herbicide application, insecticides, development and land conversion, timber harvest activities and other habitat degradation at overwintering sites, and climate change.	Nearest documented overwintering site records are within the Elk 7.5-min. USGS quad, ~23 miles to the southwest of the Planning Area along the coast (CNDDB 2023). Recent (Sept., Oct. 2023) ["research grade"] records of breeding also exist within the incorporated City limits and elsewhere within the Planning Area (iNaturalist 2023). At least two milkweed species are known from within the Planning Area: *Asclepias fascicularis* (narrow-leaf milkweed) and *Asclepias speciosa* (showy milkweed) (Calflora 2023) and the latter has been documented within the incorporated City limits (iNaturalist 2023). Another milkweed species, *Asclepias eriocarpa* (kotolo), is known to occur just beyond the Planning Area to the east. It is likely that all three milkweed species occur elsewhere within the incorporated City limits, within the proposed expanded SOI, and elsewhere in the Planning Area where suitable habitat occurs.

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	Conservation Status Listing and Rank						
Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Fish							
Entosphenus tridentatus (Pacific Lamprey)	NA	NA	SSC	G4	S3	Ancient, anadromous fish from the north Pacific Ocean and tributary drainages which, as adults are parasitic on a variety of marine and other anadromous fish species. Spends 1–3 years at sea before migrating into freshwater rivers and streams in February–June where they are believed to spend another year before spawning from March–July in gravel/cobble substrates. Eggs hatch into immature “ammocoetes,” which drift downstream to areas of low flow velocity and burrow into fine substrates where they persist as filter feeders on diatoms and algae until they reach sexual maturity after 3–7 years and emigrate to the ocean between fall and spring. Thought to historically have been distributed wherever salmon and steelhead also occurred, but their distribution and abundance more recently are declining. Threats: Passage barriers (e.g., tide gates, culverts, in-stream diversions, etc.), stream channel dewatering events, in-stream construction and channel simplification, pollution and water quality degradation, predation by non-native fish species, and climate change.	Documented within the Planning Area in Outlet Creek (Goodman 2021) as well as elsewhere throughout the Mainstem, Middle Fork, North Fork, and South Fork Eel River system (Goodman 2021; CNDDB 2023; pers. obs.; etc.). Potentially suitable spawning, rearing, and migratory habitat exists within the Planning Area, including within the incorporated City limits and proposed expanded SOI. Such habitat includes portions of the various tributaries of Outlet Creek, including Willits, Mill, Broaddus, Baechtel, Haehl, Upp, Berry, and Davis Creeks.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**		
Oncorhynchus kisutch (Pop. 2) (Coho Salmon—Southern OR/Northern CA ESU) Primary identified threats to Middle Mainstem Eel River Coho include: extreme hydrologic events (e.g., drought- or diversion-related low flows adversely affecting migration and rearing, flooding such as that associated with atmospheric river events scouring away or burying redds, etc.); reduced access to floodplain habitats; channel simplification and reduced channel habitat complexity (due in large part to reduced availability of large wood features in streams); dams and other passage barriers; reduced summer baseflows due to inadequate bypass stream flow around instream reservoirs as well as stream diversions associated with *Cannabis* cultivation and rural residential development; road-generated fine sediment and pollution; elevated water temperatures; disease; and predation/competition from invasive species (e.g.; Sacramento Pikeminnow, *Ptychocheilus grandis*; New Zealand Mudsnail, *Potamopyrgus antipodarum*; etc.).	FT	ST	NA	G5T2Q	S2	Anadromous fish in the north Pacific Ocean and tributary drainages. In California, their range historically extended south from the Oregon border to the streams of Monterey Bay. The Southern OR/Northern CA Evolutionarily Significant Unit (ESU) includes that portion of the [naturally spawning] population inhabiting rivers and streams emptying into the Pacific Ocean between Cape Blanco (Oregon), south to Punta Gorda (California). Adults return to freshwater during September–January to migrate upstream with increased winter flows and spawn in smaller streams with well-aerated, medium to small gravel substrates. Fertilized eggs incubate in gravels from November–April and hatchlings remain in interstitial spaces until they emerge as fry through ~July. Rearing of juveniles occurs in estuaries or low-gradient coastal streams, sloughs and side-channels. After developing for ~one year, smolts migrate to the ocean typically during March–April where they remain for 1–2 years before returning to natal freshwater streams to spawn and die. The Middle Mainstem Eel River [Coho] Population, which includes individuals inhabiting that portion of the mainstem Eel River watershed extending upstream from its confluence with the Middle Fork Eel at Dos Rios to its confluence with Tomki Creek, as well as the entirety of the Outlet Creek watershed, is considered to have a "High Extinction Risk" (NMFS 2014), and the minimum number of spawners required for ESU viability is estimated to be 6,300 (NMFS 2014).	Outlet Creek was historically considered to be the largest producer of coho salmon within the Middle Mainstem Eel River [Coho] Population (NMFS 2014). The California Department of Fish and Game identified the portion of the Coho population found within the upper tributaries of Outlet Creek to be one of the longest migrating populations of Coho in California (CDFG 2004), a life history strategy that National Marine Fisheries Service characterized as being, "unique to the Eel River basin and important to the long-term survival and recovery of the SONCC coho salmon ESU as well as to the Interior Eel River Diversity Stratum" (NMFS 2014). Within the Planning Area, including within the incorporated City limits and proposed expanded SOI, much of Outlet, Mill, Willits, Broaddus, and Baechtel Creeks, as well as ~1 mile of Haehl Creek are included within the mapped distribution of Coho (Christy 2022), and spawning records for Coho exist from the late 80s/early 90s for Outlet, Willits, Broaddus, and Baechtel Creeks (Brown and Moyle 1991 *in* NMFS 2014), as well as from 2007/2008 in Mill and Willits Creeks (Harris *in* NMFS 2014). Corroborating intrinsic potential models for Coho reflect "high" (0.66–1.0) potential throughout most reaches of Outlet Creek tributaries within the Planning Area (Williams et al. 2006 *in* NMFS 2014).

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Oncorhynchus mykiss irideus (Pop. 48) (Steelhead—Northern CA DPS, “Summer-Run”) Primary identified threats to the Northern California Steelhead DPS include: extreme hydrologic events (e.g., drought- or diversion-related low flows adversely affecting migration and rearing, flooding such as that associated with atmospheric river events scouring away or burying redds, etc.); reduced access to floodplain habitats; channel simplification and reduced channel habitat complexity (due in large part to reduced availability of large wood features in streams); dams and other passage barriers; reduced summer baseflows due to inadequate bypass stream flow around instream reservoirs as well as stream diversions associated with *Cannabis* cultivation and rural residential development; road-generated fine sediment and pollution; elevated water temperatures; disease; and predation/competition from invasive species (e.g.; Sacramento Pikeminnow, *Ptychocheilus grandis*; New Zealand Mudsnail, *Potamopyrgus antipodarum*; etc.).	FT	SE	NA	G5T2Q	S2	Anadromous fish in the north Pacific Ocean and tributary drainages. In California, their range currently extends from the Oregon border to south of Santa Barbara. The Northern CA Distinct Population Segment (DPS) includes that portion of the [naturally spawning] population inhabiting rivers and streams emptying into the Pacific Ocean between Redwood Creek (Humboldt County), south to—but not including—the Russian River (Sonoma County). Steelhead exhibit broad life history plasticity. Some juveniles remain in freshwater habitats for one year, while others remain for multiple years (r = 1–4 years) before emigrating as smolts to the ocean where they mature, typically remaining at sea for 2 years though that period ranges from 1–4 years. “Summer-run” (“stream-maturing”) Steelhead are sexually immature when they return from the ocean to enter freshwater May–October and must spend several months maturing in freshwater before they spawn during December–March. Emigration to the ocean typically occurs from late winter–early summer. Optimal freshwater habitat conditions for Steelhead include: channel complexity, adequate stream flow, suitable water temperatures, unimpeded passage, adequate quantities of clean spawning gravel, and access to low velocity overwintering habitat during high flow events. Where all three species occur, typical suitable Steelhead habitat extends further upstream than for Coho and Chinook Salmon.	The nearest known population of summer-run Steelhead is in the Upper Middle Mainstem Eel River, upstream of its confluence with Outlet Creek. Potentially suitable spawning, rearing, and migratory habitat does exist within the Planning Area, including within the incorporated City limits and the proposed expanded SOI, however, Outlet Creek and its tributaries are not believed to have supported a summer-run population of Steelhead historically.

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	Conservation Status Listing and Rank						
Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Oncorhynchus mykiss irideus (Pop. 49) (Steelhead—Northern CA DPS, "Winter-Run") Primary identified threats to the Northern California Steelhead DPS include: extreme hydrologic events (e.g., drought- or diversion-related low flows adversely affecting migration and rearing, flooding such as that associated with atmospheric river events scouring away or burying redds, etc.); reduced access to floodplain habitats; channel simplification and reduced channel habitat complexity (due in large part to reduced availability of large wood features in streams); dams and other passage barriers; reduced summer baseflows due to inadequate bypass stream flow around instream reservoirs as well as stream diversions associated with *Cannabis* cultivation and rural residential development; road-generated fine sediment and pollution; elevated water temperatures; disease; and predation/competition from invasive species (e.g.; Sacramento Pikeminnow, *Ptychocheilus grandis*; New Zealand Mudsnail, *Potamopyrgus antipodarum*; etc.).	FT	NA	NA	G5T3Q	S3	Anadromous fish in the north Pacific Ocean and tributary drainages. In California, their range currently extends from the Oregon border to south of Santa Barbara. The Northern CA Distinct Population Segment (DPS) includes that portion of the [naturally spawning] population inhabiting rivers and streams emptying into the Pacific Ocean between Redwood Creek (Humboldt County), south to—but not including—the Russian River (Sonoma County). Steelhead exhibit broad life history plasticity. Some juveniles remain in freshwater habitats for one year, while others remain for multiple years (r = 1–4 years) before emigrating as smolts to the ocean where they mature, typically remaining at sea for 2 years though that period ranges from 1–4 years. "Winter-run" ("ocean-maturing") Steelhead are sexually mature when they return from the ocean to enter freshwater November–April and spawn shortly thereafter. Emigration to the ocean typically occurs from late winter–early summer. Optimal freshwater habitat conditions for Steelhead include: channel complexity, adequate stream flow, suitable water temperatures, unimpeded passage, adequate quantities of clean spawning gravel, and access to low velocity overwintering habitat during high flow events. Where all three species occur, typical suitable Steelhead habitat extends further upstream than for Coho and Chinook Salmon.	Winter-Run Steelhead of the Northern California DPS do occur and reproduce in the tributaries of Outlet Creek. The Outlet Creek population is part of the Lower Interior Diversity Stratum and is considered an Essential (Independent) Population within the recovery context for that species' DPS (Bjorkstedt et al. 2005 *in* NMFS 2016). The respective recovery abundance population target for Outlet Creek is ≥3,800 spawners (NMFS 2016). CDFW (*in* NMFS 2016) found that 88% of larger Outlet Creek tributaries were inhabited by Steelhead; which is estimated to represent <50% of historic habitat likely used by the species (Spence et al. 2012 *in* NMFS 2016). LeDoux-Bloom and Downie (2007 *in* NMFS 2016) characterized stream habitat suitability for Steelhead as "medium" quality in Outlet, Willits [Mill], Broaddus, and Baechtel Creeks. They also reported that Willits [Mill] Creek exhibited cooler water temperatures (attributed to the extent of forest along its riparian corridor), whereas Outlet, Baechtel, Broaddus, and Davis Creek stream temperatures were "marginal to unsuitable" when and where sampled. Modeled intrinsic potential for the Northern California Steelhead DPS is moderate (0.35–0.69) throughout Outlet Creek and associated tributaries within the Planning Area, with a segment of middle Baechtel Creek reflecting high (0.7–1.0) intrinsic potential (Bjorkstedt et al. 2005 *in* NMFS 2016).

Oncorhynchus tshawytscha (Pop. 17) (Chinook Salmon—CA Coastal ESU)	FT	NA	NA	G5T2Q	S2	Anadromous fish in the north Pacific Ocean and tributary drainages. In California, their range extends from the Oregon border south to the streams of San Francisco Bay. The CA Coastal Evolutionarily Significant Unit (ESU) includes that portion of the [naturally spawning] population inhabiting rivers and streams emptying into the Pacific Ocean between—and inclusive of—Redwood Creek (Humboldt County), south to—and inclusive of—the Russian River (Sonoma County). All members of this ESU are currently “fall-run” Chinook. Adults return to freshwater at an advanced stage of reproductive maturity from August–January where they migrate to spawn within only a few weeks’ time in clean loose gravel substrates in the mainstem or lower river tributaries. After emerging from redds, juveniles quicky move to estuarine or marine environments the following April–July. After entering the ocean, Chinook spend 2–5 years at sea before returning to natal streams to spawn and die. Primary identified threats to the California Coastal Chinook ESU include: extreme hydrologic events (e.g., drought- or diversion-related low flows adversely affecting migration and rearing, flooding such as that associated with atmospheric river events scouring away or burying redds, etc.); reduced access to floodplain habitats; channel simplification and reduced channel habitat complexity (due in large part to reduced availability of large wood features in streams); dams and/or other passage barriers; stream diversions; road-generated fine sediment and pollution; elevated water temperatures; disease; and predation/competition from invasive species (e.g.; Sacramento Pikeminnow, *Ptychocheilus grandis*; New Zealand Mudsnail, *Potamopyrgus antipodarum*; etc.).	California Coastal ESU Chinook are known to occur within Outlet Creek and its tributaries within the Planning Area, including the incorporated City limits and proposed expanded SOI. Chinook in the Outlet Creek watershed are identified as being part of the North Mountain-Interior Diversity Stratum within the Upper Eel River population, which is considered an Essential (Independent) Population within the recovery context for that species’ ESU (Bjorkstedt et al. 2005 *in* NMFS 2016). The respective recovery abundance population target for the Upper Eel River population is ≥10,600 spawners (NMFS 2016). Modeled intrinsic potential for the California Coastal Chinook ESU is high (0.7–1.0) within the mainstem Outlet Creek but decreases to moderate (0.35–0.69) throughout the rest of the watershed upstream (Bjorkstedt et al. 2005 *in* NMFS 2016). The Outlet Creek watershed and associated tributaries were identified as a priority restoration reach within the Upper Eel River hydrologic unit as part of the general recovery strategy for the species (NMFS 2016), where recommended actions included: improving habitat complexity, restoration and improvement of fish passage, increasing riparian canopy cover and large woody debris availability, and reducing road-based sediment delivery to streams, among others.

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	Conservation Status Listing and Rank						
Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Amphibians							
Rana aurora (Northern Red-legged Frog)	NA	NA	SSC	G4	S3	Inhabits humid forests, woodlands, grasslands, diked former tidelands, dune hollows, and stream banks in northwest California and the Pacific Northwest, often near dense riparian cover. Breeds in standing water in vegetated permanent wetlands and seasonal pools that persist long enough for completion of larval development (3–5 months), typically from late fall–early spring. Usually found near permanent water but can occur far from water in damp woods and meadows during the non-breeding season. Threats include habitat loss, water quality degradation, the introduction of the non-native American Bullfrog (*Lithobates catesbeianus*), introduced pathogens, and climate change.	Nearest documented occurrence records are from ~9 miles to the southwest of the Planning Area from the Big River watershed in the Comptche 7.5-min. USGS quad (CNDDB 2023). Potentially suitable habitat does occur within the Planning Area, including within the incorporated City limits and the proposed expanded SOI. Such habitat primarily consists of wetlands, stream channels, ponds, and associated riparian habitats.
Rana boylii (Foothill Yellow-legged Frog) (Pop. 1 — North Coast DPS)	NA	NA	SSC	G3T4	S4	Found in a variety of inland riparian habitats including broad exposed river bars with a rocky substrates, partly-shaded streams and riffles, and freshwater wetlands, but can also occur far from water in damp woods and meadows outside of the breeding season. Typically not found within the fog belt of the immediate coast. Breeds in moderately shallow streams and river margins with dependable streamflow. Egg masses are usually attached to the downstream side of small boulders, large cobble–gravel substrates, or submerged vegetation. Larval development typically ranges 3–4 months. Threats include water quality degradation, hydroperiod alteration (associated with reservoir management actions and/or stream diversions), habitat loss, the introduction of the non-native American Bullfrog (*Lithobates catesbeianus*), introduced pathogens, and climate change.	One (1) documented occurrence within the incorporated City limits near the confluence of Broaddus and Baechtel Creeks, and numerous others in the vicinity of the Planning Area (CNDDB 2023; iNaturalist 2023; etc.). Suitable habitat occurs throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily consisting of stream corridors and adjacent riparian vegetation.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Taricha rivularis (Red-bellied Newt)	NA	NA	SSC	G2	S2	Typically nocturnal or crepuscular during their terrestrial phase, but transition to being aquatic and active day and night during the breeding season. Breeds in rocky streams and rivers with moderate–fast flows February–May. Avoids ponds, lakes, and similar lentic aquatic habitats. Larval development is temperature dependent and ranges 4–6 months. Juveniles are thought to primarily be fossorial until they reach sexual maturity at 4–6 years. Threats include impacts to stream flows and water quality, loss of forest and grassland habitats due to agriculture and development, mortality on roads during breeding season migrations, and climate change.	Two (2) documented occurrences within the Planning Area include one within the incorporated City limits in the Haehl Creek watershed and another within the proposed expanded SOI in the Broaddus Creek watershed (CNDDB 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily along streams and their associated riparian corridors.
Reptiles							
Emys marmorata (Northwestern Pond Turtle)	FPT	NA	SSC	G3G4	S3	Diurnal and aquatic turtle found in ponds, marshes, rivers, streams, irrigation ditches, reservoirs, and canals with aquatic vegetation. Basking sites and suitable nearby upland habitat (e.g., sandy banks or grassy open fields) for egg-laying are critical habitat features, necessary for survival and reproduction. Sexual reproduction isn't reached until 8–10 years of age and breeding typically occurs from April–May (–August). Eggs are laid in terrestrial nests in upland areas adjacent to aquatic habitats with easily excavatable substrates (e.g., sand, etc.). Individuals often overwinter in a state of torpor either underwater or in underground burrows in woodlands or other upland habitats above the reach of high flow events. Threats include trapping and human consumption, wetland drainage and similar forms of habitat conversion, predation by introduced non-native American Bullfrogs (*Lithobates catesbeianus*), competition from introduced non-native turtle species, mortality on roads during breeding season migrations, and climate change.	One (1) documented occurrence beyond the incorporated City limits at Lake Emily—an instream reservoir along Willits Creek, which flows through the Planning Area, incorporated City limits, and proposed expanded SOI (CNDDB 2023). Suitable habitat does occur within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area along ponds, impoundments, aquatic features of natural origin and their associated upland riparian areas.

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Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Birds							
Accipiter atricapillus (Recently separated from *A. gentilis*) (Northern Goshawk)	NA	NA	SSC	G5	S3	Largest North American accipiter occupies a diversity of habitats but prefers mature forests on moderate slopes with open understories and large trees. Typically nests in largest trees within nesting stands, and both conifer and hardwood species may be used. Prey range from large passerines, grouse, and corvids to rabbits and tree squirrels. Primary published threats are attributed to timber harvest activities, though increased incidences of landscape-level wildfire-related stand replacement events could also be an emerging threat.	Nearest documented breeding records include one (1) from ~3 miles east of the Planning Area within the Willits 7.5-min USGS quad near the headwaters of a tributary to Tomki Creek (eBird 2023), and three (3) separate occurrences in the upper mainstem Eel River watershed, each ~12–14 miles east-southeast of the Planning Area (CNDDB 2023). Potentially suitable nesting habitat with some mature forest and larger trees may occur within the incorporated City limits near Morris Dam along Davis Creek and near the Willits Municipal Airport, as well as along forested slopes within the proposed expanded SOI, and similar habitats elsewhere in the Planning Area.
Accipiter cooperi (Cooper's Hawk)	NA	NA	WL	G5	S4	Occurs in open or marginal woodlands and nests in both conifer and hardwood tree species. One analysis found that in California, oaks are the most common nest tree species (Asay 1987). Commonly utilizes urban areas and has successfully nested in ornamental trees. Typical prey species include small to medium-sized songbirds, doves, and small mammals. Primary threats include mortality related to collisions with anthropogenic objects (≤70% [Boal and Mannan 1999]) as well as reductions in prey species for various reasons primarily attributed to habitat conversion throughout wintering, migratory, and breeding ranges. Depredation of prey species by domestic or feral cats may also be a contributing factor to declines in prey species abundance.	No documented records of definitive breeding Cooper's Hawks were encountered in our research of the immediate vicinity of the Planning Area, although one (1) indication of possible breeding just outside the Planning Area to the west of Centennial Dam along Davis Creek (eBird 2023) is noteworthy. Numerous non-breeding observations of the species have been recorded within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area (eBird 2023) and nesting is likely in suitable forested habitat therein. Potentially suitable forested nesting habitat occurs throughout the Planning Area and proposed expanded SOI, and to a lesser extent with the incorporated City limits. Ample foraging habitat along riparian corridors and other forested areas also occurs throughout the Planning Area.

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Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Accipiter striatus (Sharp-shinned Hawk)	NA	NA	WL	G5	S4	Highly specialized predator of smaller birds, such prey comprise ~90% of diet, with small mammals, frogs and insects making up the balance. Occupies dense to semi-open montane coniferous, deciduous, or mixed forests, and tends to prefer riparian habitats. Nests in conifers, oaks, maples, etc. within in small stands of conifers with dense foliage, typically within 275 feet of water. Primary threats include mortality related to vehicles and window strikes near bird feeders as well as reductions in prey species for various reasons primarily attributed to habitat conversion throughout wintering, migratory, and breeding ranges. Depredation of prey species by domestic or feral cats is likely also a contributing factor to declines in prey species abundance.	Nearest documented breeding records are from ~3 miles west of the Planning Area within the Burbeck 7.5-min USGS quad near the headwaters of Noyo River (CNDDB 2023) and potentially just outside the Planning Area to the west of Centennial Dam along Davis Creek (eBird 2023), though numerous additional non-breeding observations of the species have also been recorded within the incorporated City limits and elsewhere throughout the Planning Area (eBird 2023). Potentially suitable forested nesting habitat occurs throughout the Planning Area and proposed expanded SOI, and to a lesser extent with the incorporated City limits. Ample foraging habitat along riparian corridors and other forested areas also occurs throughout the Planning Area.
Ammodramus savannarum (Grasshopper Sparrow)	NA	NA	SSC	G5	S3	Small, inconspicuous sparrow of grassland habitats. Consumes insects and seeds and nests on the ground in domed grass and other herbaceous vegetation tufts, or occasionally shrubs. Primary threats include conversion of grassland habitats, habitat degradation due to over-grazing, and direct mortality related to agricultural practices in breeding habitat during the breeding season (e.g., mowing, etc.).	Breeding has been documented within the Planning Area (eBird 2023) and additional records of potentially breeding individuals from suitable nesting habitat elsewhere within the Planning Area during the breeding season have also been reported (eBird 2023). Additional breeding records exist within the Purdy's Garden and Garberville 7.5-min. USGS quads, ~24 miles to the southeast and ~50 miles to the northwest, respectively (CNDDB 2023; pers. obs.). Suitable nesting habitat occurs throughout the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

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Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Aquila chrysaetos (Golden Eagle)	NA	NA	FP	G5	S3	One of the world's largest birds of prey, Golden Eagles occupy a wide variety of habitats. Most nest site descriptions from western North America are from cliffs, though large trees are also used where exposed rock faces and outcrops are less abundant across the landscape due to vegetation cover, and trees provide suitable nest platform characteristics. Some ground nests have also been described. Primary prey consists of medium-sized birds and mammals such as rabbits, hares, ground squirrels, and prairie dogs, though they are known to take prey as large as wild ungulates (occasionally even domestic livestock). Also known to scavenge for carrion. Threats: Primary published threats include habitat conversion and climate change, lead and other chemical poisoning from contaminated carrion or prey, wind turbine collisions, electrocution from perching on uninsulated power conductors, and the illegal take associated with black-market for cultural/religious items. Most North American populations are declining or below carrying capacity.	Nearest available breeding records in CNDDB (2023) are 38 miles to the north of the Planning Area in the mainstem Eel River watershed and two (2) others ~38 miles to the southeast of the Planning Area, though at least one other breeding pair is known from ~30 miles north of the Planning Area, also in the mainstem Eel River watershed (pers. obs.). Numerous other non-breeding observations have been documented within the Planning Area (eBird 2023). Potentially suitable nesting habitat occurs throughout the Planning Area, but is limited within the proposed expanded SOI, and all but absent within the incorporated City limits.
Ardea herodias (Great Blue Heron)	NA	NA	NA	G5	S4	Occurs widely in lakes, ponds, sloughs, rivers, marshes, and other wetland habitats, and feeds on fish, amphibians, invertebrates, reptiles, small mammals, and even other birds. Nests in close proximity to foraging habitat, typically colonially in rookeries with other nesting pairs, but also as single pairs. Nest building is usually at height in trees but can also be found on cliffsides or on the ground where predator pressures are low. Threats have historically included poisoning of prey species and habitats by industrial contaminants and anthropogenic hunting for feather plumes. Primary threats at present consist of wetland conversion and habitat loss, and from human disturbance, particularly at breeding sites.	Nearest documented breeding records are from ~20 miles west-northwest of the Planning Area near the mouth of Ten Mile River and ~25 miles southeast of the Planning Area near Clear Lake (CNDDB 2023). Some observations within the Planning Area have been documented during the breeding season (eBird 2023). Potentially suitable nesting and foraging habitat occurs within the incorporated City limits, proposed expanded SOI, and elsewhere within the Planning Area, primarily associated with riparian corridors and wetland habitats.

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Chaetura vauxi (Vaux's Swift)	NA	NA	SSC	G5	S2S3	Breeds (typically colonially) in preexisting cavities in larger trees created by decay, fire, or natural excavators such as woodpeckers. Nesting stand forest types are typically conifer-dominated, and nest trees are typically conifers, though nests in some hardwood species within such forest types are also known. Will occasionally use chimneys in towns and cities. Migratory roost sites are similar to those described for breeding. Forages for flying insects in forest openings, burned-over forest, meadows, rivers, lakes, and suburban development. Primary threats are related to loss of nesting habitat (i.e., larger, older trees) through forest management practices that do not also prioritize adequate retention of larger and/or senescent trees (e.g., fuels management and forest “health” projects, some commercial timber harvest strategies, etc.). Loss of such habitat due to climate change and increasing incidence of high-intensity wildfire is also a concern.	Nearest documented breeding records are from ~13 miles southwest of the Planning Area in the Navarro 7.5-min. USGS quad (CNDDB 2023). Some observations within the Planning Area have been documented during the breeding season (eBird 2023). Potentially suitable nesting and roosting habitat occurs within the incorporated City limits, proposed expanded SOI, and elsewhere within the Planning Area, primarily consisting of more mature forested habitats with Douglas-fir (*Pseudotsuga menziesii*) and/or coast redwood (*Sequoia sempervirens*) component, though unused chimneys in urban contexts cannot be ruled out.

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Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Coccyzus americanus occidentalis (Western Yellow-billed Cuckoo)	FT	SE	NA	G5T2T3	S1	Prefers riparian forests along broad river flood-plains but can also occur in isolated habitat patches and narrow riparian "stringers." Nest stands vary with habitat conditions and plant species composition throughout the species' range, but they often nest in dense and structurally complex mixed willow (*Salix* spp.) and cottonwood (*Populus* spp.) thickets, with an understory of blackberry (*Rubus* spp.), wild grape (Vitis spp.), etc. Various successional stages of woody riparian vegetation may be important habitat components. Capable of very short breeding periods. Nest construction can be as short as 2–3 days and first egg is often laid prior to completion of nest building. Period between egg laying–fledging ranges from 18–20 days. Diet is primarily composed of large insects, and occasionally, arboreal frogs and lizards. Also known to consume eggs/young of other birds and, on wintering grounds, fruits and seeds. Threats include collisions with anthropogenic structures such as windows, vehicles, and towers, but primary threats include loss of riparian forest habitat and pesticide exposure, both direct exposure where nesting habitat interfaces with orchards (e.g., English walnuts, etc.) as well as loss of insect prey abundance and diversity resulting from widespread insecticide use.	Nearest documented breeding season occurrence records are from ~23 miles southwest of the Planning Area near the Navarro River estuary (eBird 2023), ~42 miles southeast of the Planning Area near Clearlake, ~63 miles to the east of the Planning Area along the Sacramento River, and ~90 miles northwest of the Planning Area near the Eel River estuary (CNDDB 2023). Potentially suitable forested nesting habitat occurs within the incorporated City limits, proposed expanded SOI, and elsewhere within the Planning Area, primarily associated with forested riparian corridors, particularly where willow (*Salix* spp.) and/or cottonwood (*Populus* spp.) are present.
Elanus leucurus (White-tailed Kite)	NA	NA	FP	G5	S3S4	A regular local resident and breeder in northern California, they primarily hunt small mammals (e.g., voles, etc.), but are also known to consume birds, lizards, and insects. Forages in open grasslands, meadows, oak woodlands, wetlands, and agricultural habitats with ungrazed patches. Perches and nests in dense portions of the upper crowns of solitary trees or in similar canopy positions within contiguous forest stands, often near forest/grassland edges or other similar habitat transitions. Threats are primarily attributed to the loss of nesting and foraging habitats and anthropogenic disturbances during the breeding season.	At least five (5) documented breeding records exist from within the Planning Area, one (1) of which is from within the incorporated City limits (eBird 2023). Numerous other breeding-season observations within the Planning Area have also been documented, including from within the proposed expanded SOI (eBird 2023). Suitable nesting and foraging habitat (as described) occurs within the incorporated City limits, proposed expanded SOI, and elsewhere within the Planning Area.

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Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Empidonax traillii brewsteri (Willow Flycatcher)	NA	SE	NA	G5T3T4	S3	Neotropical migratory flycatcher that inhabits riparian areas associated with rivers, streams, and wetlands. Typically breeds in habitats where willows (*Salix* spp.) are well represented. In addition to classic riparian stands and "stringers," occupied sites in northern California and southern Oregon have included beaver meadows, regenerating clear cuts, and mesic openings in coniferous forests where willows (*Salix* spp.) are present. Primary threats are attributed to habitat loss and degradation related to urbanization and over-grazing of wetland and riparian habitats, as well as alteration/interruption of natural hydrological regimes (e.g., stream diversions, channelization, de-watering, dam-related inundation, etc.). Parasitism of other subspecies (i.e., *E. t. extimus*) by Brown-headed Cowbirds (*Molothrus ater*) has also been reported to be a significant threat.	At least two (2) records of potential breeding behavior exhibited by *E. traillii* within suitable habitat during the breeding season exist within the incorporated City limits (eBird 2023). Sporadic other non-breeding-season observations have also been reported elsewhere within the Planning Area (eBird 2023). Suitable nesting habitat occurs within the incorporated City limits, proposed expanded SOI, and elsewhere within the Planning Area, primarily associated with forested riparian corridors, particularly where willow (*Salix* spp.) and/or cottonwood (*Populus* spp.) are present.
Falco peregrinus anatum (American Peregrine Falcon)	FDR	SDR	FP	G4T4	S3S4	Storied falcon, well known for exceptional speeds reached during diving attacks on prey. Primarily hunts medium-sized flocking birds such as shorebirds, seabirds, waterfowl, pigeons, etc., but is also known to take other bird species as well as bats, amphibians, squirrels, insects, and even fish dropped from harassed Osprey (*Pandion haliaetus*). Preferred nesting sites include inaccessible cliffs on rocky outcrops and in river gorges, but also successfully nests in abandoned Bald Eagle (*Haliaeetus leucocephalus*) nests as well as on human-made structures such as skyscrapers, electric towers, and channel buoys. Also known to breed in cavities in coast redwood (*Sequoia sempervirens*) trees and snags. Historically threatened by egg collection and trapping for falconry, as well as eggshell thinning resulting from bioaccumulation of pesticides in prey species. Contemporary threats are largely attributed to collision with anthropogenic structures (e.g., building windows; vehicles; aircraft; wind turbines; powerlines, conductors, and guy wires; etc.) and changes in the availability and composition of food resources owing to multiple factors including wetland conversion and similar habitat loss, climate change effects on ocean currents and dependent populations/food webs, etc.	Nearest documented breeding records are from ~8 miles southwest of the Planning Area in the Bailey Ridge 7.5-min. USGS quad and ~16 miles east of the Planning Area in the Lake Pillsbury 7.5-min. USGS quad (CNDDB 2023). Species observations have been documented, both during and outside of the breeding season, throughout the Planning Area (eBird 2023). Potentially suitable nesting habitat is absent within the incorporated City limits and likely limited within the proposed expanded SOI and elsewhere throughout the Planning Area. Such habitat would consist primarily of sheer cliffs or rock outcrops at higher elevations, or possibly cavities or broken-tops in emergent trees within mature Douglas-fir (*Pseudotsuga menziesii*)- and/or coast redwood (*Sequoia sempervirens*)-dominated forest stands.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Haliaeetus leucocephalus (Bald Eagle)	FDR	SE	FP	G5	S3	In forested areas nesting habitat is generally located in stands with at least some old-growth characteristics including varying age classes, stratified canopies, snags and senescent individuals, canopy gaps, and emergent trees. In non-forested habitats ground nests have been documented from cliffs, ridges, and sea stacks with good flight access but limited (terrestrial) predator access. Typically located within one mile of a river, lake, or ocean shore that supports adequate food supply for both nesting and wintering. An opportunistic forager that will consume carrion, Bald Eagles prefer fish, but also prey on shorebirds, seabirds, waterfowl, aquatic mammals, reptiles, amphibians, crustaceans. Historically threatened by shooting and trapping, as well as eggshell thinning resulting from bioaccumulation of pesticides in prey species. Contemporary threats are largely attributed to collision with anthropogenic structures (e.g.; wind turbines; powerlines, conductors, and guy wires; etc.), lead poisoning from prey or carrion, large oil spills, and development and associated habitat loss.	Nearest documented breeding records are from ~4 miles northwest of the Planning Area in the Longvale 7.5-min. USGS quad and both ~10 and ~21 miles east of the Planning Area in the upper mainstem Eel River watershed (CNDDB 2023). Additional observations have also been documented, both during and outside of the breeding season, throughout the Planning Area, including some that could indicate nesting sites nearer to, or within, the Planning Area itself (eBird 2023). Potential nesting habitat within the incorporated City limits is likely too close to human disturbance to be considered "suitable" (given nearby alternative options) but forest structural characteristics within the proposed expanded SOI, and elsewhere throughout the Planning Area could potentially support nesting Bald Eagles.
Icteria virens (Yellow-breasted Chat)	NA	NA	SSC	G5	S4	Prefers areas of dense undergrowth, brambles, thickets and shrubs, including riparian areas, clear cuts, fallow field edges, forest edges and fencerows. Nests are typically built low (< 8 feet), off the ground in dense vegetation, including but not limited to berry brambles (*Rubus* spp.), grape vines (*Vitis* spp.), willows (*Salix* spp.), rose (*Rosa* spp.), dogwood (*Cornus* spp.), etc. Diet is composed primarily of insects and spiders, as well as fruits and berries as the latter mature throughout the season. Populations have declined substantially, primarily due to habitat loss and degradation resulting from direct anthropogenic alteration as well as climate change-related plant community shifts. Habitat loss as a result of increasing incidence of high-intensity wildfire may also be an emerging threat to breeding habitat in some areas. Similarly, fuels reduction projects and eradication efforts targeting invasive vegetation used for nesting (e.g., *Rubus armeniacus*, "Himalayan blackberry") during the breeding season likely also pose a threat to this species.	Breeding has been documented in riparian habitats within the incorporated City limits and the northern portion of the Planning Area (CNDDB 2023). Numerous additional records of potentially breeding individuals from suitable nesting habitat within the incorporated City limits, the proposed expanded SOI, and elsewhere throughout the Planning Area during the breeding season (and beyond) have also been reported (eBird 2023). Suitable nesting habitat does occur within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area, primarily represented by brambles, thickets, and scrub along riparian corridors and within or adjacent to other wetland habitats.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Nycticorax nycticorax (Black-crowned Night Heron)	NA	NA	NA	G5	S4	Forages nocturnally or at dawn/dusk in freshwater and salt marshes, pond edges, mudflats, croplands, and along slow-moving streams. Their opportunistic diet varies widely, and includes fish, leeches, earthworms, insects, aquatic invertebrates, amphibians, reptiles, small mammals, birds, eggs, vegetation, and even carrion and human garbage. Roosts and nests in a variety of locations—including one reported instance of "rubble"—but more often in dense stands of trees, shrubs, or emergent wetland vegetation, as well as occasionally on cliffs, ledges, or on the ground among boulders. Threats include poisoning of food resources and habitats by pesticides and industrial contaminants, wetland conversion and habitat loss, and from human disturbance, particularly at breeding sites.	Nearest confirmed breeding records are from ~5 miles southeast of the Planning Area within the Redwood Valley 7.5-min. USGS quad (CNDDB 2023). At least one other observation from suitable habitat within the Planning Area have been documented during the breeding season (eBird 2023). Potentially suitable nesting and foraging habitat occurs within the incorporated City limits, proposed expanded SOI, and elsewhere within the Planning Area, primarily associated with riparian corridors and wetland habitats.
Pandion haliaetus (Osprey)	NA	NA	WL	G5	S4	Forages over fish-producing lakes, reservoirs, rivers, estuaries, and the open sea coast (Fix and Bezener 2000). Diet is primarily (>99%) composed of fish (Poole and Gill 2023). Roosts and builds large nests on exposed treetops, towers, pilings, or similar structures in close proximity to foraging waters. Regular summer resident and breeder, with some individuals also over-wintering near major feeding areas (Harris 1996). Historically threatened by shooting, trapping, and egg collection; as well as eggshell thinning resulting from bioaccumulation of pesticides in prey species. Contemporary threats are largely attributed to collision with anthropogenic structures (e.g.; wind turbines; powerlines, conductors, and guy wires; etc.), lead poisoning from prey or carrion, large oil spills, and development and associated habitat loss. Declining anadromous fish populations is also a significant threat to this primarily piscivorous bird of prey.	Nearest documented breeding record is from within the Willits 7.5- min. USGS quad (eBird 2023), as well as ~8 miles southeast of the Planning Area near Lake Mendocino (CNDDB 2023), and both ~11 and ~12 miles east of the Planning Area in the upper mainstem Eel River watershed (CNDDB 2023). Additional non-breeding observations have also been documented, both during and outside of the breeding season, throughout the Planning Area (eBird 2023). Potentially suitable nesting habitat (as described) does exist within the proposed expanded SOI and elsewhere throughout the Planning Area, but is limited within the incorporated City limits.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Progne subis (Purple Martin)	NA	NA	SSC	G5	S3	Breeds in riparian and oak woodlands, partially logged, damaged or burned coniferous forests and montane mixed forests, nesting in cavities (usually old woodpecker cavities) of tall trees and snags, often near water (Fix and Bezener 2000). Similar holes in anthropogenic structures such as bridges, overpasses, etc. are also known to be used for nesting, as well as are constructed “bird houses” specifically for nesting Purple Martins. Foraging for flying insects occurs over bottomlands, bays, coastal lagoons, ponds, riparian areas, and other wetland habitats. Primary threats are related to loss of nesting habitat (i.e., larger, older trees) through forest management practices that do not also prioritize adequate retention of larger and/or senescent trees with cavities (e.g., fuels management and forest “health” projects, some commercial timber harvest strategies, etc.). Loss of such habitat due to climate change and increasing incidence of high-intensity wildfire is also a concern. Competition for use of suitable nest cavities from introduced European Starlings (*Sturnus vulgaris*) and House Sparrows (*Passer domesticus*), as well as reductions in prey species abundance due to extensive use of pesticides, particularly neonicotinoid and pyrethroid insecticides, also pose a threat to this species as well.	At least two breeding instances have been documented within the incorporated City limits (eBird 2023), and other observations during the breeding season have been recorded elsewhere within the Planning Area (eBird 2023). Additional confirmed breeding is known in the adjacent Foster Mountain 7.5-min. USGS quad to the east and elsewhere in the region (CNDDB 2023). Suitable nesting habitat (as described) occurs within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.
Setophaga petechia (Yellow Warbler)	NA	NA	SSC	G5	S3	Insectivorous neotropical migratory warbler, inhabits riparian areas associated with rivers, streams, and wetlands. Typically breeds in habitats where willows (*Salix* spp.) are well represented, often also with alder (*Alnus* spp.) and/or cottonwood (*Populus* spp.) species as well. Primary threats are attributed to habitat loss and degradation related to urbanization and over-grazing of wetland and riparian habitats. Parasitism by Brown-headed Cowbirds (*Molothrus ater*) has also been reported to be a significant threat.	Breeding has been documented in riparian habitats within the incorporated City limits and the northern portion of the Planning Area (CNDDB 2023). Numerous additional records of potentially breeding individuals from suitable nesting habitat within the incorporated City limits, the proposed expanded SOI, and elsewhere throughout the Planning Area during the breeding season (and beyond) have also been reported (eBird 2023). Suitable nesting habitat (as described) does occur within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

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Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Spinus lawrencei (Lawrence's Goldfinch)	NA	NA	NA	G3G4	S4	Small passerine with strong preferences for native plant seeds such as those of fiddleneck (*Amsinckia* spp.), chamise (*Adenostoma fasciculatum*), etc. Typically nests near water in oak woodlands with abundant epiphytic fruticose lichens, which are regularly incorporated into nest construction, along with grasses, etc. Primary threats include removal/degradation of nesting habitat and native forage plants.	Breeding has been documented within the incorporated City limits (eBird 2023) and additional records of potentially breeding individuals from suitable nesting habitat elsewhere within the Planning Area during the breeding season have also been reported (eBird 2023). Additional breeding records exist within the Redwood Valley 7.5-min. USGS quad to the southeast (CNDDB 2023). Suitable nesting habitat (as described) does occur within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.
Strix occidentalis caurina (Northern Spotted Owl)	FT	ST	NA	G3G4T3	S2	Generally inhabits structurally complex late-seral and old-growth conifer forests for nesting, roosting and foraging, though individuals may visit less complex forest stands during dispersal events and to hunt. Low heat tolerance and the need to reposition often to find favorable microclimate may explain the complex habitat requirements of this species to some extent (Barrows & Barrows 1978). Primary threats include habitat loss, fragmentation, and simplification associated with timber harvest activities and increasing incidence of high-intensity wildfire events, as well as competition, depredation, and interbreeding with introduced Barred Owls (*Strix varia*). Poisoning of prey species with rodenticides and/or other pesticides—particularly as a result of illegal *Cannabis* cultivation in remote areas and throughout the wildland urban interface—has also become an emergent threat.	Three (3) activity centers occur within the Planning Area, near the northern and southern extents, and other activity centers and detections have been documented within 0.5–1 mile to the west of the proposed expanded SOI (CNDDB 2023). Other such detections have also been documented beyond, but in close proximity to, the Planning Area (CNDDB 2023). Some potentially suitable nesting, roosting, foraging, and dispersal habitats (as described) exist within the Planning Area, including within the proposed expanded SOI. Of the aforementioned four types of Northern Spotted Owl habitat, only limited patches of marginal foraging and/or dispersal habitats occur within the incorporated City limits.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA[†]	CDFW[‡]	GRank[§]	SRank[§]		
Mammals							
Antrozous pallidus (Pallid Bat)	NA	NA	SSC	G4	S3	Occupies a variety of open habitats including grasslands, shrublands, oak savannahs, open coniferous forests, and orchards and vineyards. Can roost alone or in small groups, but typically roosts gregariously in larger groups. Roost sites are typically unobstructed, insulated from temperature extremes, and high above the ground, but exceptions have been documented. Typical roost sites include rock outcrops; caves and mine shafts; tree trunk and bole cavities; exfoliating bark of conifers, oaks, and other deciduous trees; and anthropogenic structures such as bridges, trestles, barns, vacant and occupied buildings, bat boxes, etc. Opportunistic generalist feeders that both glean and hunt on the wing. Their diet consists primarily of insects, but they have been known to take small reptiles and rodents. Mating occurs October–February at primary roosts while overwintering and weaning of young happens when maternal colonies disperse between August–October. Alternate roosts may be used on occasion and roosts may or may not be reused from year to year. Species is not known to migrate long distances between winter and summer sites. Threats include mass displacement when gregarious roosts are destroyed or sufficiently disturbed due to timber harvest activities, wildfire events, demolition of occupied structures, and recreation (e.g., rock-climbing, spelunking, etc.); loss of roosting and foraging habitat due to urbanization and associated development; and reductions in prey species abundance due to widespread applications of insecticides and other pesticides. The fungal infection, "white-nose syndrome," also threatens many bat species.	Nearest documented occurrence records are from within the Willits and adjacent Redwood Valley 7.5- min. USGS quads, as well as others in the vicinity (CNDDB 2023). Potentially suitable roosting and foraging habitat (as described) does exist within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

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	Conservation Status Listing and Rank						
Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Arborimus pomo (Sonoma Tree Vole)	NA	NA	SSC	G3	S3	Nocturnal arboreal rodent that primarily inhabits canopies of late-seral or old-growth coniferous or mixed hardwood-conifer forests with a Douglas-fir (*Pseudotsuga menziesii*) component. Douglas-fir needles are this species’ primary food source. Known to be more abundant in older forests, they are sometimes found in younger stands. Nests are made in tree cavities, broken tops, epiphyte mats, or in a collection of gathered sticks, twigs, and fruticose lichens. Discarded resin ducts and fresh or picked over Douglas-fir needles and branchlets, as well as distinctive fecal pellets often provide evidence of presence. An important food source for Northern Spotted Owl (*Strix occidentalis caurina*), Humboldt Martin (*Martes caurina humboldtensis*), and Fisher (*Pekania pennanti*), other threats include timber harvest activities, and increasingly, high-intensity wildfire events.	Four (4) occurrences are documented in forested habitats within the Planning Area, with one being within ~0.5 miles of the incorporated City limits and proposed expanded SOI (CNDDB 2023). Potentially suitable habitat (as described) does exist within the Planning Area, including within the proposed expanded SOI. Potentially suitable habitat within the incorporated City limits itself does exist, but is limited.
Bassariscus astutus raptor (Northern California Ringtail)	NA	NA	FP	G5TNR	SNR	Close relative to raccoons and primarily nocturnal, they are dept and agile climbers, and are typically found in forests, woodlands, or rocky habitats. Habitat depending, they den in tree cavities, interstices in boulders, caves, mine shafts, and unoccupied (or little used) anthropogenic structures. Marking latrines often provide unmistakable evidence of presence/occupation. Diet is opportunistic and variable; includes passerine birds, eggs, mice, squirrels, rabbits, amphibians and reptiles, insects, fruits, seeds, and carrion. Published threats reference hunting and trapping for their pelts. Where they overlap with human habitation and agriculture, poisoning from rodenticides and other pesticides may also pose a threat.	Nearest documented occurrence records are from ~10 miles west of the Planning Area in the North Fork Big River watershed (iNaturalist 2023), and within the Laytonville and Dos Rios 7.5- min. USGS quads, ~11 miles north of the Planning Area (CNDDB 2023). Potentially suitable habitat (as described) does exist within oak woodland and other forested or rocky portions of the Planning Area, including the proposed expanded SOI and to a lesser extent within the incorporated City limits. Unused anthropogenic structures in less frequented rural and urban contexts also cannot be ruled out.

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Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Cervus canadensis nannodes (Tule Elk)	NA	NA	NA	G5T3	S3	Elk can be found in a variety of habitats including grasslands, emergent wetlands, hardwood forests, mixed conifer forests, oak woodlands, and shrublands. They often prefer habitat mosaics or the interface between open grasslands/shrublands with better foraging opportunities and forests where they can quickly find concealment and/or protection. Forests can also provide corridors for seasonal or migratory movements and lowland forests are often important wintering habitats for elk. In regions not subject to regular deep snowfall events, however, Tule Elk tend not to migrate seasonally. Elk are opportunistic herbivores and their diet can vary from grasses and forbs to "browse" (i.e., nutritious tender shoots of woody shrubs and trees) depending upon the season, habitat, and forage availability. The elk breeding season or "rut" typically occurs from August–November, and can extend later for Tule Elk given the warmer temperatures experienced where that subspecies is distributed. Mature bulls often become solitary or separate into small groups after the rut, but herds mostly form combined groups to overwinter. In May–June, cows become solitary to calve in areas of dense, concealing vegetation and bulls that are not already separated from the herd will do so. Threats include illegal hunting, vehicle collisions, fence entanglement, and land management practices that decrease the availability and abundance of shrubs and early-successional browse. Historic fire suppression and over-grazing by domesticated livestock have contributed to senescent shrublands and similar habitats where productivity for native ungulates is inadequate. Exposure to diseases from affected livestock can also pose a threat to co-occurring elk populations as well.	Both Tule Elk (*Cervus canadensis nannodes*) and Roosevelt Elk (*C. c. roosevelti*) occupied California historically, though their abundance and distributions have changed radically since the arrival of Eurasian human populations. Through natural dispersal and intentional translocations, populations of both subspecies are re-establishing and some interbreeding may be occurring where the two interface. The home range of the Little Lake Valley subherd of the Mendocino Tule Elk Management Unit occupies much of the northern portion of the Planning Area, as well as a substantial portion of the northern half of the contiguous incorporated City limits (Hilson 2023). Although the Little Lake Valley subherd is not thought to migrate between traditional summer and winter seasonal ranges, it has been speculated that this subherd may have become established by dispersal from the Sherwood Valley subherd and given the migration potential of the species, some movements and exchange is to be expected, especially as populations continue to grow. Suitable habitat (as described) does exist within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Corynorhinus townsendii (Townsend's Big-eared Bat)	NA	NA	SSC	G4	S2	Occupies a variety of habitats including riparian areas, grasslands, woodlands, coniferous forests, orchards and other agricultural areas. Being moth specialists, their diet is composed almost entirely of Lepidopterans, which they hunt along forest edges and riparian corridors. They are known to travel large distances (> 90 miles) during a single evening while foraging. Can roost alone or in small groups, but typically roosts gregariously in larger groups. Roost use varies within and between seasons and years, but they demonstrate high site-fidelity in areas where roost availability is limited. Typical roost sites include caves and mine shafts; large tree trunk and bole cavities; and anthropogenic structures such as bridges, trestles, barns, vacant and occupied buildings, etc.—though they are highly susceptible to human disturbance. Mating occurs October–February and maternal colonies form May–June. Seasonal movements are poorly understood, though there is some evidence of local migration. Threats include destruction of, or disturbance to, roost sites and hibernacula resulting from timber harvest activities, wildfire events, demolition of occupied structures, and recreation (e.g., rock-climbing, spelunking, etc.); loss of roosting and riparian foraging habitat due to urbanization and associated development; and reductions in prey species abundance due to widespread applications of insecticides and other pesticides. The fungal infection, “white-nose syndrome,” also threatens many bat species.	Nearest documented occurrence records are from within the Willits and three adjacent 7.5-min. USGS quads (i.e., Greenough Ridge, Laughlin Range, and Redwood Valley) (CNDDB 2023). Potentially suitable hibernacula, roosting, and foraging habitat (as described) does exist within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

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Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Eumops perotis californicus (Western Mastiff Bat)	NA	NA	SSC	G4G5T4	S3S4	Largest bat native to North America with a wingspan of up to ~22 inches, they occupy a variety of open habitats including grasslands, shrublands, oak savannahs, open coniferous forests, chaparral, and desert environments. Unusual among most North American bats, they remain active throughout winter and are thought not to hibernate or migrate. Mating begins in early spring and offspring are born in mid-summer. Colony size is typically < 100 individuals. Roosts occur in rock crevices associated with outcrops, cliffs and canyons, and occasionally in anthropogenic analogs such as in tunnels and tall buildings. Roosts have at least 9 feet of vertical clearance below, to allow for access and egress as this species is unable to land and take flight from flat ground. This attribute also limits their ability to hydrate as they are unable to drink from open water with less than 100 feet of relatively unobstructed access. Their diet consists primarily of moths and other flying insects, but they are also known to consume some flightless insects as well and primarily forage along riparian corridors. Threats include destruction of, or disturbance to, roosting and riparian foraging habitat due to urbanization and associated development, and recreation (e.g., rock-climbing, spelunking, etc.). Regional drought and reduced availability of suitable hydration sites is also thought to be a threat to this species. Reductions in prey species abundance due to widespread applications of insecticides and other pesticides and the spread of the fungal infection, "white-nose syndrome," threaten this and other bat species as well.	Nearest documented occurrence records are from the adjacent Redwood Valley 7.5-min. USGS quad, ~2 miles to the south of the Planning Area; and the Lake Pillsbury 7.5-min. USGS quad, ~15 miles to the east of the Planning Area. The next nearest are from along the Sacramento River system and in the adjacent Sierra Nevada foothills > 70 miles to the east of the Planning Area (CNDDB 2023). Potentially suitable roosting habitat may occur within the Planning Area where exposed rock outcrops occur, though these are believed to be limited or lacking altogether within the incorporated City limits and proposed expanded SOI. However, larger, taller anthropogenic structures (e.g., buildings, infrastructure associated with the U.S. 101 Willits Bypass, etc.) within the incorporated City limits, proposed expanded SOI, and elsewhere in the Planning Area cannot be ruled out as potentially suitable roosting habitat. Suitable foraging habitat (as described) also exists within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area as do some sporadic water features which could represent adequate hydration sites.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Lasionycteris noctivagans (Silver-haired Bat)	NA	NA	NA	G3G4	S3S4	Primarily a forest bat, they are typically found in northern temperate coniferous and mixed-conifer/hardwood forests. The majority of their diet consists of moths, though other insects are also consumed, which they hunt along riparian corridors and forest edges, above the forest canopy, and over grasslands and wetlands. They are known to travel considerable distances between roosting sites and foraging areas. They breed in early spring and birth in mid-summer and females form small (≤ 70 individuals) maternal nursery colonies and roost in tree cavities or under loose bark on large snags (though other roost types are known), typically > 50 feet above the ground. They utilize numerous alternate roost sites throughout the season within a given area and, therefore, likely require forest stands with clusters of multiple large trees and/or snags. Considerable seasonal latitudinal migratory movements have been documented and hibernacula most commonly occur in tree cavities, under bark, and in rock crevices. A few other instances under wood piles, in leaf litter, buildings, mines, and caves have also been reported. Threats are primarily related to loss of roosting, foraging, and migratory habitat due to timber harvest activities that do not provide for sufficient retention of clusters of larger diameter trees and snags, as well as removal/degradation of riparian corridor habitats associated with urbanization and related development. Reductions in prey species abundance due to widespread applications of insecticides and other pesticides, and further spread of the fungal infection, "white-nose syndrome," also threaten many bat species.	Nearest documented occurrence records are from the adjacent Burbeck 7.5- min. USGS quad, as well as others in the vicinity (e.g., Noyo Hill, Bailey Ridge, Dutchman's Knoll, etc.) (CNDDB 2023). Potentially suitable hibernacula, roosting, and foraging habitat (as described) does exist within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Lasiurus frantzii (Western Red Bat)	NA	NA	SSC	G4	S3	A solitary and highly migratory species that ranges from as far north as British Columbia (Canada) during the summer, to as far south as South America during the boreal winter. They typically roost and hibernate in dense tree foliage (and occasionally caves). At least in North American territories, they appear to be associated with intact riparian habitats that have well represented willow (*Salix* spp.) and/or cottonwood (*Populus* spp.) components, where their diet consists of various flying insects. Mating occurs in late summer–early autumn and pregnant females birth in early spring. Threats include the loss of riparian roosting and foraging habitat due to agricultural habitat conversion as well as to urbanization and associated development. Reductions in prey species abundance due to widespread applications of insecticides and other pesticides also pose a threat to this species. Given that they will sometimes roost in leaf litter, fuels reduction projects and associated controlled burning of such material may also threaten Western Red Bat.	Nearest documented occurrence records are from the adjacent Burbeck and Redwood Valley 7.5-min. USGS quads, as well as others in the vicinity (e.g., Van Arsdale Reservoir, Lake Pillsbury, etc.) (CNDDB 2023). Potentially suitable roosting and foraging habitat (as described) does exist within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.
Martes caurina humboldtensis (Humboldt Marten)	FT	SE	SSC	G4G5T1	S1	Typically associated with more mesic, structurally-complex late-successional coniferous forests, though an isolated population from a young coastal Oregon forest was recently identified. Despite some diversity in arborescent density/structural complexity across occupied sites, a complex and cohesive shrub understory layer appears to be a consistent and important habitat attribute. Uses cavities in trees, snags, logs, and rocky areas for refugia and denning. Diet consists primarily of rodents, birds, and fruit. Threats include trapping, deforestation, and both timber harvest activities and high-intensity stand-replacement wildfire events that reduce forest stand structural complexity. Direct poisoning and poisoning of prey species with rodenticides and/or other pesticides likely also pose a threat to Humboldt Marten.	Nearest records are historic (pre-1980 and ca. 1950s) from the adjacent Brushy Mountain 7.5-min. USGS quad and elsewhere in Mendocino National Forest (CNDDB 2023; Zielinski et al. 2001; USFWS 2018). Current available scientific information indicates that Humboldt Marten has been extirpated from Mendocino, Sonoma, and most of Humboldt and Del Norte Counties despite the fact that the historical range of the subspecies extended ≤ 50 miles inland from the coast in California, south to approximately Fort Ross in Sonoma County (USFWS 2018). Of verifiable historical records for northern California with precise geographical information (n = 24), 83% were from coast redwood (*Sequoia sempervirens*) and Douglas-fir (*Pseudotsuga menziesii*) forests < 15 miles from the coast and no records were from > 22 miles from the coast (USFWS 2018). Potentially suitable habitat does exist within the Planning Area, primarily in densely forested portions of the proposed expanded SOI and elsewhere outside the incorporated City limits.

Appendix A, Table 1. Special Status Fish and Wildlife Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each category, taxa are listed alphabetical order. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Pekania pennanti (Fisher) (Northern CA/Southern OR DPS)	NA	NA	SSC	G5	S2S3	Typically found in structurally-complex mature and late-seral coniferous forests and/or deciduous-riparian areas with high canopy closure and abundant coarse woody debris. Uses cavities in trees, snags, logs, and rocky areas for refugia and denning. Distribution is thought to be limited from areas subject to more frequent deep snowfall events. General predators that consume mice, squirrels, chipmunks, rabbits, hares, and porcupines, but also known to eat birds, insects, nuts, fruits, and fungi. Fisher populations crashed after the arrival of Eurasian human populations. Threats include hunting and trapping, and both timber harvest activities and high-intensity stand-replacement wildfire events that reduce forest stand structural complexity and remove large diameter trees and coarse woody debris. Direct poisoning and poisoning of prey species with rodenticides and/or other pesticides—particularly as a result of illegal *Cannabis* cultivation in remote areas and throughout the wildland urban interface—has also become an emergent threat to Fishers.	Nearest documented occurrence records include three (3) from within the Willits 7.5-min. USGS quad, just outside (< 1 mile) the Planning Area (CNDDB 2023). Other records also occur within the vicinity (CNDDB 2023). Suitable habitat does exist within the Planning Area, primarily in densely forested portions of the proposed expanded SOI and elsewhere outside the incorporated City limits.
Taxidea taxus (American Badger)	NA	NA	SSC	G5	S3	Mostly nocturnal, badgers inhabit dry open grasslands, fields, pastures, orchards, and other agricultural areas. Dens are in underground in burrows they excavate and line with grasses and other vegetation. Burrows can be extensive, with multiple tunnels and chambers up to ~10 feet underground. Spend winters in a state of torpor. Badgers are carnivorous and their diet consists of mainly fossorial or terrestrial animals such as rodents, as well as skunks, birds, reptiles, amphibians, insects, fish, and carrion. Threats include vehicle collisions where roads without wildlife passages transect territories, development, habitat conversion, and intentional trapping, hunting, and poisoning.	Nearest documented occurrence records are from the adjacent Redwood Valley, Longvale, and Brushy Mountain 7.5- min. USGS quads; ~1, ~3, and ~5 miles from the Planning Area, respectively (CNDDB 2023). Potentially suitable habitat (as described) does exist within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

Conservation Status, Listing, and Rarity Rank Designations

***Federal Endangered Species Act (FESA)**

FE: Federal Endangered
FT: Federal Threatened
FPE: Federal Proposed Endangered
FPT: Federal Proposed Threatened
FC: Federal Candidate
FDR: Federal Delisted (Recovered)
FDE: Federal Delisted (Extinct)

†California Endangered Species Act (CESA)

SE: State Endangered
ST: State Threatened
SCE: State Candidate Endangered
SCT: State Candidate Threatened
SR: State Rare
SDR: State Delisted (Recovered)
SDE: State Delisted (Extinct)
SNR: State Not Reviewed

‡California Department of Fish & Wildlife's (CDFW) Other Status Designations

FP: Fully Protected species
SSC: Species of Special Concern
WL: Watch List

§Global (G) / State (S) / Infraspecific Trinomial Taxon (T) Rarity Ranks (NatureServe Conservation Status Ranks)

G/S/T—X: Presumed extinct or eliminated; not located despite extensive, focused search efforts
G/S/T—H: Possibly extinct or eliminated; known only from historic records, but with the potential for rediscovery
G/S/T—1: Critically imperiled, due to extreme rarity (often 5 or fewer occurrences) and because of factors making it especially vulnerable to extirpation
G/S/T—2: Imperiled, due to rarity, very restricted range, very few occurrences (20 or fewer), steep declines
G/S/T—3: Vulnerable, due to restricted range, populations 80 and fewer, recent declines
G/S/T—4: Apparently secure, but with cause for long-term concern due to declines or other factors
G/S/T—5: Secure, due to common or widespread abundance
Q: Questionable taxonomy that may reduce conservation priority
?: Inexact numeric rank

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* Federal Endangered Species Act (1973 as amended)
† California Endangered Species Act (1970 as amended)
‡ Other California Department of Fish and Wildlife (CDFW) Special Status Designations (CDFW 2023b)
§ NatureServe ("Heritage Method") Conservation Status Ranks (NatureServe 2023)

Appendix A, Table 2. Special Status Botanical Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each botanical category, taxa are listed alphabetically. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Vascular Plants							
Alisma gramineum (grass Alisma)	NA	NA	2B.2	G5	S3	Aquatic rhizomatous perennial herb found in freshwater marshes and other wetland habitats Known Threats: Road construction and maintenance	Two (2) documented occurrences within the Planning Area just beyond the incorporated City limits (CNDDB 2023). Suitable habitat does occur within the Planning Area, primarily consisting of standing water in riparian habitats, shallow pools, inundated ditches, swales, stock ponds, and similar impoundments; including within the Incorporated City limits and the proposed expanded SOI.
Anisocarpus scabridus (scabrid alpine tarplant)	NA	NA	1B.3	G3	S3	Perennial herb found in metamorphic, rocky, upper montane coniferous forests above 5,000 feet Known Threats: None attributed	Nearest documented occurrences are ~12 miles northeast of the Planning Area on Big Signal Peak (CNDDB 2023). Potentially suitable habitat within the Planning Area is limited, particularly within the incorporated City limits and proposed expanded SOI.
Arctostaphylos auriculata (Mt. Diablo manzanita)	NA	NA	1B.3	G2	S2	Perennial evergreen shrub found in (sandstone) chaparral and cismontane woodlands Known Threats: Road maintenance	Nearest documented occurrences are ~120 miles southeast of the Planning Area (CNDDB 2023). Potentially suitable habitat within the Planning Area is limited, particularly within the incorporated City limits and proposed expanded SOI.
Astragalus agnicidus (Humboldt County milk-vetch)	NA	SE	1B.1	G2	S2	Perennial herb often found in disturbed areas, roadsides and openings within broadleaf upland and North Coast coniferous forests Known Threats: Grazing, competition, timber harvest activities, and road maintenance; potentially also by habitat alteration and non-native plants	Nearest documented occurrences are ~3 miles west of the Planning Area (CNDDB 2023). Potentially suitable habitat within the Planning Area is limited, particularly within the incorporated City limits and proposed expanded SOI.
Astragalus rattanii var. *rattanii* (Rattan's milk-vetch)	NA	NA	4.3	G4T4	S4	Perennial herb associated with gravelly substrates and streambanks in chaparral, cismontane woodlands, and lower montane coniferous forest Known Threats: None attributed	Nearest documented occurrences are beyond the Planning Area, ~1 mile to the west within the Broaddus Creek watershed (CCH1 2023). Potentially suitable habitat does occur within the Planning Area, primarily consisting of forested slopes along the western edge and streambanks, including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.

Appendix A, Table 2. Special Status Botanical Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each botanical category, taxa are listed alphabetically. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Blennosperma bakeri (Sonoma sunshine)	FE	SE	1B.1	G1	S1	Annual herb associated with vernal pools, and mesic valley and foothill grasslands Known Threats: Residential development, urbanization, grazing, and agriculture; possibly also by non-native plants, foot traffic and road maintenance	Nearest known occurrence is relatively isolated, near U.S. Highway 101 along the "Ridgewood Grade" in the Laughlin Range 7.5-min. USGS quad, south of the Planning Area (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and vernally mesic grasslands.
Brasenia schreberi (watershield)	NA	NA	2B.3	G5	S3	Aquatic rhizomatous perennial herb found in freshwater marshes and other wetland habitats Known Threats: None attributed	Nearest documented occurrences are ~3 miles northwest of the Planning Area in the Sherwood Creek watershed and ~6 miles southwest of the Planning Area at Leonard Lake (CNDDB 2023). Potentially suitable habitat does occur within the Planning Area, primarily consisting of standing water in inundated wetlands, ponds, reservoirs, and similar impoundments; including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.
Calystegia collina ssp. *tridactylosa* (three-fingered morning-glory)	NA	NA	1B.2	G4T1	S1	Perennial rhizomatous morning glory associated with rocky/gravelly substrates (often serpentinite) in openings within chaparral and cismontane woodlands Known Threats: Possibly by geothermal energy development	Nearest documented occurrence is ~14 miles northeast of the Planning Area in Eden Valley (CNDDB 2023). Potentially suitable habitat within the Planning Area is limited, particularly within the incorporated City limits and proposed expanded SOI.
Ceanothus gloriosus var. *exaltatus* (glory brush)	NA	NA	4.3	G4T4	S4	Perennial evergreen shrub found in chaparral Known Threats: Habitat disturbance	Nearest documented occurrences are just beyond the Planning Area to the north (~0.5 miles) along U.S. Highway 101 (CCH1 2023). Potentially suitable habitat does exist within the northwestern and southern regions of the Planning Area, but likely not within the incorporated City limits or proposed expanded SOI.
Cryptantha dissita (serpentine Cryptantha)	NA	NA	1B.2	G3	S3	Annual herb found in serpentine chaparral Known Threats: Development	Nearest documented occurrences are ~13 miles northeast of the Planning Area near Eden Valley and ~21 miles south of the Planning Area near Lakeport (CNDDB 2023). Potentially suitable habitat within the Planning Area is limited, particularly within the incorporated City limits and proposed expanded SOI.

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Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Cryptantha excavata (deep-scarred Cryptantha)	NA	NA	1B.1	G1	S1	Annual herb associated with sandy/gravelly substrates in cismontane woodlands Known Threats: Potentially by reservoir construction	Nearest documented occurrence is relatively isolated and ~5 miles east of the Planning Area in the upper Russian River watershed (i.e., Busch Creek) (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the proposed expanded SOI, but such habitat is limited within the incorporated City limits.
Cypripedium montanum (mountain lady's-slipper)	NA	NA	4.2	G5	S3	Rhizomatous perennial orchid found in cismontane woodlands and broadleaf upland, lower montane coniferous, and North Coast coniferous forests Known Threats: Timber harvest activities and horticultural collecting; possibly also by road maintenance, vehicles, recreational activities, non-native plants, alteration of fire regimes, and grazing.	Nearest documented occurrences are beyond the Planning Area, from the adjacent Burbeck and Longvale 7.5-min. USGS quads (CNDDB 2023). Suitable habitat does occur within the Planning Area, primarily consisting of forested slopes along the western edge, including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.
Delphinium uliginosum (swamp larkspur)	NA	NA	4.2	G4G5	S4	Perennial herb associated with seeps and serpentinite in chaparral and valley and foothill grasslands Known Threats: None attributed	Nearest documented occurrence is from beyond the Planning Area, ~1 mile to the northwest in Sherwood Valley (CCH1 2023). Potentially suitable habitat does occur within the Planning Area, including within the proposed expanded SOI, and to a lesser extent, within the incorporated City limits, primarily in the form of wet meadows and vernally mesic grasslands or other wetland habitats (particularly where serpentine soils may occur).
Erythranthe nudata (bare monkeyflower)	NA	NA	4.3	G4	S4	Annual herb associated with seeps and springs in chaparral, cismontane woodlands; typically associated with serpentinite Known Threats: None attributed	Nearest documented occurrences are beyond the Planning Area: ~3.5 miles to the east in the Tomki Creek watershed and ~6 miles southwest of the Planning Area at Leonard Lake (CCH1 2023). Potentially suitable habitat does occur within the Planning Area (particularly where serpentine soils may occur), primarily in the form of wet meadows and vernally mesic grasslands or other wetland habitats, but likely not within the incorporated City limits or proposed expanded SOI.

Appendix A, Table 2. Special Status Botanical Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each botanical category, taxa are listed alphabetically. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Erythronium citrinum var. *citrinum* (lemon-colored fawn lily)	NA	NA	4.3	G4T4	S3	Bulbiferous perennial lily found in chaparral and lower montane coniferous forest; typically associated with serpentinite Known Threats: None attributed	Nearest documented occurrence is beyond the Planning Area, from the adjacent Burbeck 7.5-min. USGS quad (CNDDB 2023). Potentially suitable habitat within the Planning Area is limited and likely not found within the incorporated City limits or proposed expanded SOI.
Fritillaria purdyi (Purdy's fritillary)	NA	NA	4.3	G4	S4	Bulbiferous perennial lily found in chaparral, cismontane woodlands, and lower montane coniferous forest; typically associated with serpentinite Known Threats: Timber harvest activities	Nearest documented occurrences are beyond the Planning Area: ~10 miles to the east-southeast in Potter Valley, ~13 miles to the east near Big Signal Peak, and ~13 miles southeast near Ukiah (CCH1 2023). Potentially suitable habitat does occur within the Planning Area (particularly where serpentine soils may occur), but likely not within the incorporated City limits or proposed expanded SOI.
Fritillaria roderickii (= *Fritillaria biflora* var. *biflora*) (Roderick's fritillary)	NA	SE	1B.1	G1Q	S1	Bulbiferous perennial lily found in coastal bluff scrub and coastal prairies, as well as valley and foothill grasslands Known Threats: Road maintenance, residential development, and erosion	Nearest known occurrence is ~6 miles south of the Planning Area in the Laughlin Range 7.5-min. USGS quad, near Leonard Lake (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Gilia capitata ssp. *pacifica* (Pacific Gilia)	NA	NA	1B.2	G5T3	S2	Annual herb found in coastal bluff scrub and coastal prairie, chaparral (openings), and valley and foothill grasslands Known Threats: Development, recreational activities, road construction and maintenance, and timber harvest activities	One (1) documented occurrences within the Planning Area beyond the incorporated City limits (CNDDB 2023) Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Hemizonia congesta ssp. *calyculata* (Mendocino tarplant)	NA	NA	4.3	G5T4	S4	Annual herb found in cismontane woodlands, valley and foothill grasslands; occasionally associated with serpentinite Known Threats: None attributed	Two (2) historic occurrences are documented within the incorporated City limits, with additional historic occurrences near Howard Forest, and another somewhat more recent occurrence have been documented ~0.5 miles to the southwest of the Planning Area in the Baechtel Creek watershed (CCH1 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.

Appendix A, Table 2. Special Status Botanical Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each botanical category, taxa are listed alphabetically. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Hemizonia congesta ssp. *congesta* (congested-headed hayfield tarplant)	NA	NA	1B.2	G5T2	S2	Annual herb found in valley and foothill grasslands, sometimes along roadsides Known Threats: Agriculture, development, and road construction; possibly also by grazing	Nearest documented occurrence is ~16 miles west of the Planning Area in the Pudding Creek watershed (CNDDB 2023) Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Hemizonia congesta ssp. *tracyi* (Tracy's tarplant)	NA	NA	4.3	G5T4	S4	Annual herb found in openings in coastal prairie, lower montane and North Coast coniferous forests; occasionally associated with serpentinite Known Threats: None attributed	One (1) documented occurrences within the Planning Area along Walker Road, just south of the incorporated City limits (CCH1 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Hesperolinon adenophyllum (glandular western flax)	NA	NA	1B.2	G2G3	S2S3	Annual herb found (typically) in serpentine chaparral, cismontane woodlands, and valley and foothill grasslands Known Threats: Geothermal development, recreation, and grazing; potentially also by urban development	Three (3) documented occurrences within the vicinity of the Planning Are: one (1) is within the proposed expanded SOI, another (1) is just south of the incorporated City limits, and another is just west of the Planning Area in the Baechtel Creek watershed (CNDDB 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Horkelia tenuiloba (thin-lobed Horkelia)	NA	NA	1B.2	G2	S2	Perennial herb found in mesic sandy substrates in openings within chaparral, broadleaf upland forests, and valley and foothill grasslands Known Threats: Development and possibly also by foot traffic, trail maintenance, timber harvest activities, and non-native plants	Nearest documented occurrence is ~9 miles north of the Planning Area near Dos Rios (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and mesic grasslands or openings in woodlands and chaparral.
Hosackia gracilis (harlequin lotus)	NA	NA	4.2	G3G4	S3	Perennial rhizomatous herb found along roadsides, wetlands, and vernally moist locations in broad range of habitats; thought to be a larval food plant of the (coastal) federally Endangered Lotis Blue Butterfly (Lycaeides argyrognomon ssp. lotis) Known Threats: Development, grazing, feral pigs, habitat alteration, and competition	Nearest documented occurrence is beyond the Planning Area, ~5 miles to the northwest in Sherwood Valley (CCH1 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and vernally mesic grasslands or other wetland habitats.

Appendix A, Table 2. Special Status Botanical Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each botanical category, taxa are listed alphabetically. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Leptosiphon aureus (bristly Leptosiphon)	NA	NA	4.2	G4?	S4?	Annual herb typically growing in chaparral, cismontane woodlands, valley and foothill grasslands, and coastal prairie Known Threats: Road construction and maintenance	One (1) historic occurrence is documented within the incorporated City limits and other more recent occurrences have been documented ~3 miles to the north in Sherwood Valley and near the southern edge of the Planning Area in the vicinity of Laughlin Range (CCH1 2023). Potentially suitable habitat occurs throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Leptosiphon grandiflorus (large-flowered Leptosiphon)	NA	NA	4.2	G3G4	S3S4	Annual herb typically growing in sandy substrates in coastal dunes, prairies scrub and coastal bluff-scrub, as well as closed-cone coniferous forests, cismontane woodlands and valley and foothill grasslands Known Threats: development	Nearest documented occurrence records indicate presence within the Willits 7.5-min. USGS quad (Calflora 2023). Unclear where the occurrence(s) within the Willits quad is/are relative to the incorporated City limits and proposed expanded SOI. An additional documented occurrence exists from beyond the Planning Area, ~4 miles north of Willits, along U.S. Highway 101 (CCH1 2023). Potentially suitable habitat occurs throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Leptosiphon latisectus (broad-lobed Leptosiphon)	NA	NA	4.3	G4	S4	Annual herb found in broadleaf upland and cismontane woodlands Known Threats: None attributed	Four (4) occurrences are documented within the Planning Area, three of which are within the incorporated City limits—though historic. The fourth is somewhat more recent, as are others from the vicinity of the Planning Area (CCH1 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Leptosiphon rattanii (Rattan's Leptosiphon)	NA	NA	4.3	G4	S4	Annual herb found in cismontane woodlands and lower montane coniferous forest; sometimes in rocky/gravelly substrates Known Threats: None attributed	Nearest documented occurrences are beyond the Planning Area: ~3.5 miles to the east in the Tomki Creek watershed and ~6 miles southwest of the Planning Area at Leonard Lake (CCH1 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.

Appendix A, Table 2. Special Status Botanical Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each botanical category, taxa are listed alphabetically. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Lilium rubescens (redwood lily)	NA	NA	4.2	G3	S3	Bulbiferous perennial lily found in chaparral and broadleaf upland, lower montane coniferous, North Coast coniferous, and upper montane coniferous forests; sometimes associated with serpentinite and sometimes found along roadsides Known Threats: Urbanization, horticultural collecting, timber harvest activities, road construction and maintenance, non-native plants, and grazing	Nearest documented occurrences are from beyond the Planning Area, ~4 miles west of Willits, along Highway 20 and ~7 miles north of the Planning Area along U.S. Highway 101 (CCH1 2023). Suitable habitat does occur within the Planning Area, primarily consisting of forested slopes along the western edge, including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.
Limnanthes bakeri (Baker's meadowfoam)	NA	SR	1B.1	G1	S1	Annual herb associated with vernal pools, meadows, seeps, and other freshwater wetland habitats in vernally mesic valley and foothill grasslands Known Threats: Development, altered hydrology, grazing, and road construction and maintenance	Nine (9) documented occurrences within the Planning Area, three (3) of which are within or overlap the incorporated City limits (CNDDB 2023) Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows, vernally mesic grasslands, and other palustrine emergent wetland habitats.
Lupinus milo-bakeri (Milo Baker's lupine)	NA	ST	1B.1	G1Q	S1	Annual herb found in cismontane woodlands and valley and foothill grasslands; often along roadsides Known Threats: Urbanization, road maintenance, road widening, herbicide application, and possibly also by competition	Nearest known occurrence is along U.S. Highway 101, in the Longvale 7.5-min. USGS quad, north of the Planning Area (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Navarretia leucocephala ssp. *bakeri* (Baker's Navarretia)	NA	NA	1B.1	G4T2	S2	Annual herb associated with vernal pools and other vernally mesic sites in cismontane woodlands and lower montane coniferous forests, as well as valley and foothill grasslands Known Threats: Development, habitat alteration, road construction, agriculture, and potentially also by non-native plants	Six (6) documented occurrences within the Planning Area, one just outside the incorporated City limits (CNDDB 2023) Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and vernally mesic grasslands or openings in woodlands.

Appendix A, Table 2. Special Status Botanical Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each botanical category, taxa are listed alphabetically. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Perideridia gairdneri ssp. *gairdneri* (California Gairdner's yampah)	NA	NA	4.2	G5T3T4	S3S4	Perennial herb associated with vernal pools and other vernally mesic sites in broadleaf upland forests, chaparral, coastal prairie, and valley and foothill grasslands Known Threats: Agriculture, grazing, non-native plants, habitat alteration, and urbanization	Nearest documented occurrence records indicate presence within the Willits 7.5-min. USGS quad (Calflora 2023). Unclear where the occurrence(s) within the Willits quad is/are relative to the incorporated City limits and proposed expanded SOI. Additional documented occurrences from beyond the Planning Area include: ~20 miles east on Hull Mountain and ~24 miles south near Hopland (CCH1 2023). Potentially suitable habitat occurs throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Piperia candida (white-flowered rein orchid)	NA	NA	1B.2	G3?	S3	Perennial orchid associated with broadleaf upland, lower montane coniferous, and North Coast coniferous forests Known Threats: Timber harvest activities, foot traffic, and road construction and maintenance	One (1) documented occurrence within the Planning Area, which overlaps both the incorporated City limits and proposed expanded SOI; numerous others in the region (CNDDB 2023). Suitable habitat does occur within the Planning Area, primarily consisting of forested slopes along the western edge, including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.
Pityopus californicus (California pinefoot)	NA	NA	4.2	G4G5	S4	Achlorophyllous mycoparasitic perennial herb found in moist substrates in broadleaf upland, lower montane coniferous, North Coast coniferous, and upper montane coniferous forests Known Threats: Timber harvest activities	Nearest documented occurrence is ~6 miles southwest of the Planning Area at Leonard Lake (CCH1 2023). Potentially suitable habitat does occur within the Planning Area, primarily consisting of forested slopes along the western edge, including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.
Plagiobothrys lithocaryus (Mayacamas popcornflower)	NA	NA	1A	GX	SX	Annual herb associated with vernally mesic habitats within chaparral, cismontane woodlands, and valley and foothill grasslands Known Threats: None attributed	Known only from historic collections from Redwood Valley, Potter Valley, and Lakeport 7.5-min. USGS quads (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and vernally mesic grasslands or openings in woodlands and chaparral.

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Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Pleuropogon californicus var. *davyi* (Davy's semaphore grass)	NA	NA	4.3	G5T3	S3	Perennial rhizomatous grass associated with seeps and meadows in cismontane woodlands, lower montane coniferous forests, and elsewhere Known Threats: non-native plants and road construction	Ten (10) documented occurrences within the Planning Area, one (1) of which is within the incorporated City limits (CCH1 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and other palustrine emergent wetland habitats.
Pleuropogon hooverianus (North Coast semaphore grass)	NA	ST	1B.1	G2	S2	Perennial rhizomatous grass associated with wet meadows, seeps, and other mesic openings within broadleaf upland and North Coast coniferous forests Known Threats: roadside maintenance, development, timber harvest activities, feral pigs, and non-native plants	Six (6) documented occurrences within the Planning Area, one within the incorporated City limits and one just beyond (CNDDB 2023) Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows, vernally mesic grasslands and other palustrine emergent wetland habitats.
Potamogeton epihydrus (Nuttall's ribbon-leaved pondweed)	NA	NA	2B.2	G5	S2S3	Aquatic rhizomatous perennial herb found in freshwater marshes and other wetland habitats Known Threats: Recreational activities and water contamination; possibly also by vehicles	One (1) documented occurrence within the Planning Area, associated with Outlet Creek and beyond the incorporated City limits (CNDDB 2023). Suitable habitat does occur within the Planning Area, primarily consisting of standing water in riparian habitats, shallow pools, inundated ditches, stock ponds, and similar impoundments; including within the incorporated City limits and the proposed expanded SOI.
Silene bolanderi (Bolander's catchfly)	NA	NA	1B.2	G2	S2	Perennial herb found in chaparral, cismontane woodlands, lower montane coniferous and North Coast coniferous forests; meadows and seeps; often found in openings, occasionally rocky slopes, canyons and roadsides; sometimes associated with serpentinite Known Threats: Agricultural conversion, road construction and maintenance, grazing and trampling by livestock, and severe wildfires	Two (2) documented occurrences within the Planning Area, one of which is within the incorporated City limits (CNDDB 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.

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Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA[†]	CRPR[‡]	GRank[§]	SRank[§]		
Silene hookeri (Hooker's catchfly)	NA	NA	2B.2	G4	S2	Perennial herb found in chaparral, cismontane woodlands, and lower montane coniferous forest; often found in openings, occasionally rocky slopes, and sometimes associated with serpentinite Known Threats: Timber harvest activities and possibly also vegetation/fuels management activities	Nearest documented occurrence is ~12 miles northeast of the Planning Area in Eden Valley (CNDDB 2023), which appears to be an isolated occurrence and currently represents the “single putative population” within Mendocino Co. (Mesler et al. 2020). Potentially suitable habitat does occur within the Planning Area, including within the proposed expanded SOI, but is limited within the incorporated City limits.
Tracyina rostrata (beaked Tracyina)	NA	NA	1B.2	G2	S2	Annual herb found in chaparral, cismontane woodlands, and valley and foothill grasslands Known Threats: Grazing, non-native plants, and possibly also by development and vehicles	Nearest documented occurrence records indicate presence within the Redwood Valley 7.5-min. USGS quad, ~9 miles to the southeast of the Planning Area (Calflora 2023, CNDDB 2023). Additional nearby documented occurrences are ~18 miles south of the Planning Area near Lakeport and ~40 miles north of the Planning Area (i.e., Jewett Rock 7.5-min. USGS quad), (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Trifolium buckwestiorum (Santa Cruz clover)	NA	NA	1B.1	G2	S2	Annual clover associated with rocky/gravelly substrates along margins of broadleaf upland forests, cismontane woodlands, and coastal prairies Known Threats: Land clearing and non-native plants; possibly also by road construction and maintenance	Nearest documented occurrence is relatively isolated and ~3 miles south of the Planning Area in the upper Russian River watershed (i.e., Forsythe Creek watershed) (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the proposed expanded SOI, but such habitat is limited within the incorporated City limits.
Trifolium hydrophilum (saline clover)	NA	NA	1B.2	G2	S2	Annual clover associated with vernal pools, mesic valley and foothill grasslands, and other wetland habitats Known Threats: Development, trampling, road construction and maintenance, vehicles, and possibly also by non-native plants	One (1) documented occurrence within the Planning Area, beyond incorporated City limits (CNDDB 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and vernally mesic grasslands or other wetland habitats.

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Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Wyethia longicaulis (Humboldt County Wyethia)	NA	NA	4.3	G4	S4	Perennial herb found in coastal prairie, broadleaf upland and lower montane coniferous forest; sometimes along roadsides Known Threats: Road maintenance and potentially threatened by vehicles, road construction, and timber harvest activities	Nearest documented occurrence records indicate presence within the Willits and adjacent Longvale 7.5-min. USGS quads (CNDDB 2023). Unclear where the occurrence(s) within the Willits quad is/are relative to the incorporated City limits and proposed expanded SOI. Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Nonvascular Botanical Species							
"Bryophytes" ("Mosses," "Liverworts," and "Hornworts")							
Bruchia bolanderi ("Bolander's Bruchia")	NA	NA	4.2	G3	S3	Acrocarpous moss found (often buried) on damp soil in upper and lower montane coniferous forests, meadows and seeps Known Threats: Possibly threatened by fuel reduction projects, trampling, and recreational activities	Nearest documented occurrence records indicate presence within the Willits 7.5-min. USGS quad (CNDDB 2023). Unclear where the occurrence(s) within the Willits quad is/are relative to the incorporated City limits and proposed expanded SOI. Suitable habitat and substrates do occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of seeps and other mesic areas in forests and meadows.
Lichens							
Dolichousnea longissima (= *Usnea longissima*) ("Methuselah's beard lichen")	NA	NA	4.2	G4	S4	Epiphytic fruticose lichen typically in more mature trees in broadleaf upland and North Coast coniferous forests Known Threats: Threatened by development, road maintenance, and timber harvest activities	Nearest documented occurrence records indicate presence within the nearby Greenough Ridge 7.5-min. USGS quad to the southwest. (CNDDB 2023). Unclear where the occurrence(s) within the Willits quad is/are relative to the incorporated City limits and proposed expanded SOI. Potentially suitable habitat and substrates do occur within the Planning Area, primarily consisting of forested slopes along the western edge, but unlikely within the incorporated City limits and/or proposed expanded SOI.
Ramalina thrausta ("angel's hair lichen")	NA	NA	2B.1	G5?	S2S3	Epiphytic fruticose lichen typically found on dead branches/twigs in North Coast coniferous forests Known Threats: Potentially threatened by air pollution.	Nearest documented occurrence is beyond the Planning Area: ~9 miles to the northwest along Long Valley Creek (CNDDB 2023). Potentially suitable habitat and substrates do occur within the Planning Area, primarily consisting of forested slopes along the western edge, but unlikely within the incorporated City limits and/or proposed expanded SOI.

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Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Sulcaria badia ("grooved beard lichen")	NA	NA	4.2	G3	S3	Epiphytic fruticose lichen typically found on trunks and larger branches in cismontane woodland and lower montane coniferous forests; typically on hardwoods, rarely on conifers Known Threats: Potentially threatened by agricultural conversion, development, and wildfire.	Nearest documented occurrence records indicate presence within the nearby Burbeck 7.5-min. USGS quad to the west. (CNDDB 2023). Unclear where the occurrence(s) within the Willits quad is/are relative to the incorporated City limits and proposed expanded SOI. Potentially suitable habitat and substrates do occur within the Planning Area, primarily consisting of forested slopes and oak savannah along the western edge, including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.

Conservation Status, Listing, and Rarity Rank Designations

***Federal Endangered Species Act (FESA)**

- FE: Federal Endangered
- FT: Federal Threatened
- FPE: Federal Proposed Endangered
- FPT: Federal Proposed Threatened
- FC: Federal Candidate
- FDR: Federal Delisted (Recovered)
- FDE: Federal Delisted (Extinct)

†California Endangered Species Act (CESA)

- SE: State Endangered
- ST: State Threatened
- SCE: State Candidate Endangered
- SCT: State Candidate Threatened
- SR: State Rare
- SDR: State Delisted (Recovered)
- SDE: State Delisted (Extinct)
- SNR: State Not Reviewed

‡California Rare Plant Rank (CRPR)

- 1A: Presumed extirpated in CA and rare or extinct elsewhere
- 1B: Rare or endangered in CA and elsewhere
- 2A: Presumed extirpated in CA but more common elsewhere
- 2B: Rare or endangered in CA but more common elsewhere
- 3: Plants which need more information to evaluate – a review list
- 4: Plants of limited distribution – a review list

Threat Rank:

.1 – Seriously threatened in CA (over 80% of occurrences threatened, high degree of immediacy of threat)
.2 – Moderately threatened in CA (20-80% of occurrences threatened, moderate degree of immediacy of threat)
.3 – Not very threatened in CA (<20% of occurrences threatened, low degree of immediacy of threat/no current threat known)

§Global (G) / State (S) / Infraspecific Trinomial Taxon (T) Rarity Ranks (NatureServe Conservation Status Ranks)

- G/S/T—X: Presumed extinct or eliminated; not located despite extensive, focused search efforts
- G/S/T—H: Possibly extinct or eliminated; known only from historic records, but with the potential for rediscovery
- G/S/T—1: Critically imperiled, due to extreme rarity (often 5 or fewer occurrences) and because of factors making it especially vulnerable to extirpation
- G/S/T—2: Imperiled, due to rarity, very restricted range, very few occurrences (20 or fewer), steep declines
- G/S/T—3: Vulnerable, due to restricted range, populations 80 and fewer, recent declines
- G/S/T—4: Apparently secure, but with cause for long-term concern due to declines or other factors
- G/S/T—5: Secure, due to common or widespread abundance
- Q: Questionable taxonomy that may reduce conservation priority
- ?: Inexact numeric rank

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* Federal Endangered Species Act (1973 as amended)
† California Endangered Species Act (1970 as amended)
‡ California Native Plant Society (CNPS) Rare Plant Ranks (CNPS 2023b)
§ NatureServe ("Heritage Method") Conservation Status Ranks (NatureServe 2023)

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Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Vascular Plants							
Alisma gramineum (grass Alisma)	NA	NA	2B.2	G5	S3	Aquatic rhizomatous perennial herb found in freshwater marshes and other wetland habitats Known Threats: Road construction and maintenance	Two (2) documented occurrences within the Planning Area just beyond the incorporated City limits (CNDDB 2023). Suitable habitat does occur within the Planning Area, primarily consisting of standing water in riparian habitats, shallow pools, inundated ditches, swales, stock ponds, and similar impoundments; including within the Incorporated City limits and the proposed expanded SOI.
Anisocarpus scabridus (scabrid alpine tarplant)	NA	NA	1B.3	G3	S3	Perennial herb found in metamorphic, rocky, upper montane coniferous forests above 5,000 feet Known Threats: None attributed	Nearest documented occurrences are ~12 miles northeast of the Planning Area on Big Signal Peak (CNDDB 2023). Potentially suitable habitat within the Planning Area is limited, particularly within the incorporated City limits and proposed expanded SOI.
Arctostaphylos auriculata (Mt. Diablo manzanita)	NA	NA	1B.3	G2	S2	Perennial evergreen shrub found in (sandstone) chaparral and cismontane woodlands Known Threats: Road maintenance	Nearest documented occurrences are ~120 miles southeast of the Planning Area (CNDDB 2023). Potentially suitable habitat within the Planning Area is limited, particularly within the incorporated City limits and proposed expanded SOI.
Astragalus agnicidus (Humboldt County milk-vetch)	NA	SE	1B.1	G2	S2	Perennial herb often found in disturbed areas, roadsides and openings within broadleaf upland and North Coast coniferous forests Known Threats: Grazing, competition, timber harvest activities, and road maintenance; potentially also by habitat alteration and non-native plants	Nearest documented occurrences are ~3 miles west of the Planning Area (CNDDB 2023). Potentially suitable habitat within the Planning Area is limited, particularly within the incorporated City limits and proposed expanded SOI.
Astragalus rattanii var. *rattanii* (Rattan's milk-vetch)	NA	NA	4.3	G4T4	S4	Perennial herb associated with gravelly substrates and streambanks in chaparral, cismontane woodlands, and lower montane coniferous forest Known Threats: None attributed	Nearest documented occurrences are beyond the Planning Area, ~1 mile to the west within the Broaddus Creek watershed (CCH1 2023). Potentially suitable habitat does occur within the Planning Area, primarily consisting of forested slopes along the western edge and streambanks, including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.

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Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Blennosperma bakeri (Sonoma sunshine)	FE	SE	1B.1	G1	S1	Annual herb associated with vernal pools, and mesic valley and foothill grasslands Known Threats: Residential development, urbanization, grazing, and agriculture; possibly also by non-native plants, foot traffic and road maintenance	Nearest known occurrence is relatively isolated, near U.S. Highway 101 along the "Ridgewood Grade" in the Laughlin Range 7.5-min. USGS quad, south of the Planning Area (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and vernally mesic grasslands.
Brasenia schreberi (watershield)	NA	NA	2B.3	G5	S3	Aquatic rhizomatous perennial herb found in freshwater marshes and other wetland habitats Known Threats: None attributed	Nearest documented occurrences are ~3 miles northwest of the Planning Area in the Sherwood Creek watershed and ~6 miles southwest of the Planning Area at Leonard Lake (CNDDB 2023). Potentially suitable habitat does occur within the Planning Area, primarily consisting of standing water in inundated wetlands, ponds, reservoirs, and similar impoundments; including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.
Calystegia collina ssp. *tridactylosa* (three-fingered morning-glory)	NA	NA	1B.2	G4T1	S1	Perennial rhizomatous morning glory associated with rocky/gravelly substrates (often serpentinite) in openings within chaparral and cismontane woodlands Known Threats: Possibly by geothermal energy development	Nearest documented occurrence is ~14 miles northeast of the Planning Area in Eden Valley (CNDDB 2023). Potentially suitable habitat within the Planning Area is limited, particularly within the incorporated City limits and proposed expanded SOI.
Ceanothus gloriosus var. *exaltatus* (glory brush)	NA	NA	4.3	G4T4	S4	Perennial evergreen shrub found in chaparral Known Threats: Habitat disturbance	Nearest documented occurrences are just beyond the Planning Area to the north (~0.5 miles) along U.S. Highway 101 (CCH1 2023). Potentially suitable habitat does exist within the northwestern and southern regions of the Planning Area, but likely not within the incorporated City limits or proposed expanded SOI.
Cryptantha dissita (serpentine Cryptantha)	NA	NA	1B.2	G3	S3	Annual herb found in serpentine chaparral Known Threats: Development	Nearest documented occurrences are ~13 miles northeast of the Planning Area near Eden Valley and ~21 miles south of the Planning Area near Lakeport (CNDDB 2023). Potentially suitable habitat within the Planning Area is limited, particularly within the incorporated City limits and proposed expanded SOI.

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Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Cryptantha excavata (deep-scarred Cryptantha)	NA	NA	1B.1	G1	S1	Annual herb associated with sandy/gravelly substrates in cismontane woodlands Known Threats: Potentially by reservoir construction	Nearest documented occurrence is relatively isolated and ~5 miles east of the Planning Area in the upper Russian River watershed (i.e., Busch Creek) (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the proposed expanded SOI, but such habitat is limited within the incorporated City limits.
Cypripedium montanum (mountain lady’s-slipper)	NA	NA	4.2	G5	S3	Rhizomatous perennial orchid found in cismontane woodlands and broadleaf upland, lower montane coniferous, and North Coast coniferous forests Known Threats: Timber harvest activities and horticultural collecting; possibly also by road maintenance, vehicles, recreational activities, non-native plants, alteration of fire regimes, and grazing.	Nearest documented occurrences are beyond the Planning Area, from the adjacent Burbeck and Longvale 7.5-min. USGS quads (CNDDB 2023). Suitable habitat does occur within the Planning Area, primarily consisting of forested slopes along the western edge, including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.
Delphinium uliginosum (swamp larkspur)	NA	NA	4.2	G4G5	S4	Perennial herb associated with seeps and serpentinite in chaparral and valley and foothill grasslands Known Threats: None attributed	Nearest documented occurrence is from beyond the Planning Area, ~1 mile to the northwest in Sherwood Valley (CCH1 2023). Potentially suitable habitat does occur within the Planning Area, including within the proposed expanded SOI, and to a lesser extent, within the incorporated City limits, primarily in the form of wet meadows and vernally mesic grasslands or other wetland habitats (particularly where serpentine soils may occur).
Erythranthe nudata (bare monkeyflower)	NA	NA	4.3	G4	S4	Annual herb associated with seeps and springs in chaparral, cismontane woodlands; typically associated with serpentinite Known Threats: None attributed	Nearest documented occurrences are beyond the Planning Area: ~3.5 miles to the east in the Tomki Creek watershed and ~6 miles southwest of the Planning Area at Leonard Lake (CCH1 2023). Potentially suitable habitat does occur within the Planning Area (particularly where serpentine soils may occur), primarily in the form of wet meadows and vernally mesic grasslands or other wetland habitats, but likely not within the incorporated City limits or proposed expanded SOI.

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Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Erythronium citrinum var. *citrinum* (lemon-colored fawn lily)	NA	NA	4.3	G4T4	S3	Bulbiferous perennial lily found in chaparral and lower montane coniferous forest; typically associated with serpentinite Known Threats: None attributed	Nearest documented occurrence is beyond the Planning Area, from the adjacent Burbeck 7.5-min. USGS quad (CNDDB 2023). Potentially suitable habitat within the Planning Area is limited and likely not found within the incorporated City limits or proposed expanded SOI.
Fritillaria purdyi (Purdy's fritillary)	NA	NA	4.3	G4	S4	Bulbiferous perennial lily found in chaparral, cismontane woodlands, and lower montane coniferous forest; typically associated with serpentinite Known Threats: Timber harvest activities	Nearest documented occurrences are beyond the Planning Area: ~10 miles to the east-southeast in Potter Valley, ~13 miles to the east near Big Signal Peak, and ~13 miles southeast near Ukiah (CCH1 2023). Potentially suitable habitat does occur within the Planning Area (particularly where serpentine soils may occur), but likely not within the incorporated City limits or proposed expanded SOI.
Fritillaria roderickii (= *Fritillaria biflora* var. *biflora*) (Roderick's fritillary)	NA	SE	1B.1	G1Q	S1	Bulbiferous perennial lily found in coastal bluff scrub and coastal prairies, as well as valley and foothill grasslands Known Threats: Road maintenance, residential development, and erosion	Nearest known occurrence is ~6 miles south of the Planning Area in the Laughlin Range 7.5-min. USGS quad, near Leonard Lake (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Gilia capitata ssp. *pacifica* (Pacific Gilia)	NA	NA	1B.2	G5T3	S2	Annual herb found in coastal bluff scrub and coastal prairie, chaparral (openings), and valley and foothill grasslands Known Threats: Development, recreational activities, road construction and maintenance, and timber harvest activities	One (1) documented occurrences within the Planning Area beyond the incorporated City limits (CNDDB 2023) Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Hemizonia congesta ssp. *calyculata* (Mendocino tarplant)	NA	NA	4.3	G5T4	S4	Annual herb found in cismontane woodlands, valley and foothill grasslands; occasionally associated with serpentinite Known Threats: None attributed	Two (2) historic occurrences are documented within the incorporated City limits, with additional historic occurrences near Howard Forest, and another somewhat more recent occurrence have been documented ~0.5 miles to the southwest of the Planning Area in the Baechtel Creek watershed (CCH1 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.

Table Botanical. Special Status Botanical Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each botanical category, taxa are listed alphabetically. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Hemizonia congesta ssp. *congesta* (congested-headed hayfield tarplant)	NA	NA	1B.2	G5T2	S2	Annual herb found in valley and foothill grasslands, sometimes along roadsides Known Threats: Agriculture, development, and road construction; possibly also by grazing	Nearest documented occurrence is ~16 miles west of the Planning Area in the Pudding Creek watershed (CNDDB 2023) Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Hemizonia congesta ssp. *tracyi* (Tracy's tarplant)	NA	NA	4.3	G5T4	S4	Annual herb found in openings in coastal prairie, lower montane and North Coast coniferous forests; occasionally associated with serpentinite Known Threats: None attributed	One (1) documented occurrences within the Planning Area along Walker Road, just south of the incorporated City limits (CCH1 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Hesperolinon adenophyllum (glandular western flax)	NA	NA	1B.2	G2G3	S2S3	Annual herb found (typically) in serpentine chaparral, cismontane woodlands, and valley and foothill grasslands Known Threats: Geothermal development, recreation, and grazing; potentially also by urban development	Three (3) documented occurrences within the vicinity of the Planning Are: one (1) is within the proposed expanded SOI, another (1) is just south of the incorporated City limits, and another is just west of the Planning Area in the Baechtel Creek watershed (CNDDB 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Horkelia tenuiloba (thin-lobed Horkelia)	NA	NA	1B.2	G2	S2	Perennial herb found in mesic sandy substrates in openings within chaparral, broadleaf upland forests, and valley and foothill grasslands Known Threats: Development and possibly also by foot traffic, trail maintenance, timber harvest activities, and non-native plants	Nearest documented occurrence is ~9 miles north of the Planning Area near Dos Rios (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and mesic grasslands or openings in woodlands and chaparral.
Hosackia gracilis (harlequin lotus)	NA	NA	4.2	G3G4	S3	Perennial rhizomatous herb found along roadsides, wetlands, and vernally moist locations in broad range of habitats; thought to be a larval food plant of the (coastal) federally Endangered Lotis Blue Butterfly (Lycaeides argyrognomon ssp. lotis) Known Threats: Development, grazing, feral pigs, habitat alteration, and competition	Nearest documented occurrence is beyond the Planning Area, ~5 miles to the northwest in Sherwood Valley (CCH1 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and vernally mesic grasslands or other wetland habitats.

Table Botanical. Special Status Botanical Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each botanical category, taxa are listed alphabetically. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Leptosiphon aureus (bristly Leptosiphon)	NA	NA	4.2	G4?	S4?	Annual herb typically growing in chaparral, cismontane woodlands, valley and foothill grasslands, and coastal prairie Known Threats: Road construction and maintenance	One (1) historic occurrence is documented within the incorporated City limits and other more recent occurrences have been documented ~3 miles to the north in Sherwood Valley and near the southern edge of the Planning Area in the vicinity of Laughlin Range (CCH1 2023). Potentially suitable habitat occurs throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Leptosiphon grandiflorus (large-flowered Leptosiphon)	NA	NA	4.2	G3G4	S3S4	Annual herb typically growing in sandy substrates in coastal dunes, prairies scrub and coastal bluff-scrub, as well as closed-cone coniferous forests, cismontane woodlands and valley and foothill grasslands Known Threats: development	Nearest documented occurrence records indicate presence within the Willits 7.5-min. USGS quad (Calflora 2023). Unclear where the occurrence(s) within the Willits quad is/are relative to the incorporated City limits and proposed expanded SOI. An additional documented occurrence exists from beyond the Planning Area, ~4 miles north of Willits, along U.S. Highway 101 (CCH1 2023). Potentially suitable habitat occurs throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Leptosiphon latisectus (broad-lobed Leptosiphon)	NA	NA	4.3	G4	S4	Annual herb found in broadleaf upland and cismontane woodlands Known Threats: None attributed	Four (4) occurrences are documented within the Planning Area, three of which are within the incorporated City limits—though historic. The fourth is somewhat more recent, as are others from the vicinity of the Planning Area (CCH1 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Leptosiphon rattanii (Rattan's Leptosiphon)	NA	NA	4.3	G4	S4	Annual herb found in cismontane woodlands and lower montane coniferous forest; sometimes in rocky/gravelly substrates Known Threats: None attributed	Nearest documented occurrences are beyond the Planning Area: ~3.5 miles to the east in the Tomki Creek watershed and ~6 miles southwest of the Planning Area at Leonard Lake (CCH1 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.

Table Botanical. Special Status Botanical Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each botanical category, taxa are listed alphabetically. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Lilium rubescens (redwood lily)	NA	NA	4.2	G3	S3	Bulbiferous perennial lily found in chaparral and broadleaf upland, lower montane coniferous, North Coast coniferous, and upper montane coniferous forests; sometimes associated with serpentinite and sometimes found along roadsides Known Threats: Urbanization, horticultural collecting, timber harvest activities, road construction and maintenance, non-native plants, and grazing	Nearest documented occurrences are from beyond the Planning Area, ~4 miles west of Willits, along Highway 20 and ~7 miles north of the Planning Area along U.S. Highway 101 (CCH1 2023). Suitable habitat does occur within the Planning Area, primarily consisting of forested slopes along the western edge, including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.
Limnanthes bakeri (Baker's meadowfoam)	NA	SR	1B.1	G1	S1	Annual herb associated with vernal pools, meadows, seeps, and other freshwater wetland habitats in vernally mesic valley and foothill grasslands Known Threats: Development, altered hydrology, grazing, and road construction and maintenance	Nine (9) documented occurrences within the Planning Area, three (3) of which are within or overlap the incorporated City limits (CNDDB 2023) Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows, vernally mesic grasslands, and other palustrine emergent wetland habitats.
Lupinus milo-bakeri (Milo Baker's lupine)	NA	ST	1B.1	G1Q	S1	Annual herb found in cismontane woodlands and valley and foothill grasslands; often along roadsides Known Threats: Urbanization, road maintenance, road widening, herbicide application, and possibly also by competition	Nearest known occurrence is along U.S. Highway 101, in the Longvale 7.5-min. USGS quad, north of the Planning Area (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Navarretia leucocephala ssp. *bakeri* (Baker's Navarretia)	NA	NA	1B.1	G4T2	S2	Annual herb associated with vernal pools and other vernally mesic sites in cismontane woodlands and lower montane coniferous forests, as well as valley and foothill grasslands Known Threats: Development, habitat alteration, road construction, agriculture, and potentially also by non-native plants	Six (6) documented occurrences within the Planning Area, one just outside the incorporated City limits (CNDDB 2023) Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and vernally mesic grasslands or openings in woodlands.

Table Botanical. Special Status Botanical Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each botanical category, taxa are listed alphabetically. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	**Conservation Status Listing and Rank**					**Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)**	**Pertinent Distribution**
	FESA*	**CESA†**	**CRPR‡**	**GRank§**	**SRank§**		
Perideridia gairdneri ssp. *gairdneri* (California Gairdner's yampah)	NA	NA	4.2	G5T3T4	S3S4	Perennial herb associated with vernal pools and other vernally mesic sites in broadleaf upland forests, chaparral, coastal prairie, and valley and foothill grasslands Known Threats: Agriculture, grazing, non-native plants, habitat alteration, and urbanization	Nearest documented occurrence records indicate presence within the Willits 7.5-min. USGS quad (Calflora 2023). Unclear where the occurrence(s) within the Willits quad is/are relative to the incorporated City limits and proposed expanded SOI. Additional documented occurrences from beyond the Planning Area include: ~20 miles east on Hull Mountain and ~24 miles south near Hopland (CCH1 2023). Potentially suitable habitat occurs throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Piperia candida (white-flowered rein orchid)	NA	NA	1B.2	G3?	S3	Perennial orchid associated with broadleaf upland, lower montane coniferous, and North Coast coniferous forests Known Threats: Timber harvest activities, foot traffic, and road construction and maintenance	One (1) documented occurrence within the Planning Area, which overlaps both the incorporated City limits and proposed expanded SOI; numerous others in the region (CNDDB 2023). Suitable habitat does occur within the Planning Area, primarily consisting of forested slopes along the western edge, including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.
Pityopus californicus (California pinefoot)	NA	NA	4.2	G4G5	S4	Achlorophyllous mycoparasitic perennial herb found in moist substrates in broadleaf upland, lower montane coniferous, North Coast coniferous, and upper montane coniferous forests Known Threats: Timber harvest activities	Nearest documented occurrence is ~6 miles southwest of the Planning Area at Leonard Lake (CCH1 2023). Potentially suitable habitat does occur within the Planning Area, primarily consisting of forested slopes along the western edge, including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.
Plagiobothrys lithocaryus (Mayacamas popcornflower)	NA	NA	1A	GX	SX	Annual herb associated with vernally mesic habitats within chaparral, cismontane woodlands, and valley and foothill grasslands Known Threats: None attributed	Known only from historic collections from Redwood Valley, Potter Valley, and Lakeport 7.5-min. USGS quads (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and vernally mesic grasslands or openings in woodlands and chaparral.

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Taxa	Conservation Status Listing and Rank					Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)	Pertinent Distribution
	FESA*	CESA†	CRPR‡	GRank§	SRank§		
Pleuropogon californicus var. *davyi* (Davy's semaphore grass)	NA	NA	4.3	G5T3	S3	Perennial rhizomatous grass associated with seeps and meadows in cismontane woodlands, lower montane coniferous forests, and elsewhere Known Threats: non-native plants and road construction	Ten (10) documented occurrences within the Planning Area, one (1) of which is within the incorporated City limits (CCH1 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and other palustrine emergent wetland habitats.
Pleuropogon hooverianus (North Coast semaphore grass)	NA	ST	1B.1	G2	S2	Perennial rhizomatous grass associated with wet meadows, seeps, and other mesic openings within broadleaf upland and North Coast coniferous forests Known Threats: roadside maintenance, development, timber harvest activities, feral pigs, and non-native plants	Six (6) documented occurrences within the Planning Area, one within the incorporated City limits and one just beyond (CNDDB 2023) Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows, vernally mesic grasslands and other palustrine emergent wetland habitats.
Potamogeton epihydrus (Nuttall's ribbon-leaved pondweed)	NA	NA	2B.2	G5	S2S3	Aquatic rhizomatous perennial herb found in freshwater marshes and other wetland habitats Known Threats: Recreational activities and water contamination; possibly also by vehicles	One (1) documented occurrence within the Planning Area, associated with Outlet Creek and beyond the incorporated City limits (CNDDB 2023). Suitable habitat does occur within the Planning Area, primarily consisting of standing water in riparian habitats, shallow pools, inundated ditches, stock ponds, and similar impoundments; including within the incorporated City limits and the proposed expanded SOI.
Silene bolanderi (Bolander's catchfly)	NA	NA	1B.2	G2	S2	Perennial herb found in chaparral, cismontane woodlands, lower montane coniferous and North Coast coniferous forests; meadows and seeps; often found in openings, occasionally rocky slopes, canyons and roadsides; sometimes associated with serpentinite Known Threats: Agricultural conversion, road construction and maintenance, grazing and trampling by livestock, and severe wildfires	Two (2) documented occurrences within the Planning Area, one of which is within the incorporated City limits (CNDDB 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.

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Taxa	**Conservation Status Listing and Rank**					**Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)**	**Pertinent Distribution**
	FESA*	**CESA†**	**CRPR‡**	**GRank§**	**SRank§**		
Silene hookeri (Hooker's catchfly)	NA	NA	2B.2	G4	S2	Perennial herb found in chaparral, cismontane woodlands, and lower montane coniferous forest; often found in openings, occasionally rocky slopes, and sometimes associated with serpentinite Known Threats: Timber harvest activities and possibly also vegetation/fuels management activities	Nearest documented occurrence is ~12 miles northeast of the Planning Area in Eden Valley (CNDDB 2023), which appears to be an isolated occurrence and currently represents the “single putative population” within Mendocino Co. (Mesler et al. 2020). Potentially suitable habitat does occur within the Planning Area, including within the proposed expanded SOI, but is limited within the incorporated City limits.
Tracyina rostrata (beaked Tracyina)	NA	NA	1B.2	G2	S2	Annual herb found in chaparral, cismontane woodlands, and valley and foothill grasslands Known Threats: Grazing, non-native plants, and possibly also by development and vehicles	Nearest documented occurrence records indicate presence within the Redwood Valley 7.5-min. USGS quad, ~9 miles to the southeast of the Planning Area (Calflora 2023, CNDDB 2023). Additional nearby documented occurrences are ~18 miles south of the Planning Area near Lakeport and ~40 miles north of the Planning Area (i.e., Jewett Rock 7.5-min. USGS quad), (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Trifolium buckwestiorum (Santa Cruz clover)	NA	NA	1B.1	G2	S2	Annual clover associated with rocky/gravelly substrates along margins of broadleaf upland forests, cismontane woodlands, and coastal prairies Known Threats: Land clearing and non-native plants; possibly also by road construction and maintenance	Nearest documented occurrence is relatively isolated and ~3 miles south of the Planning Area in the upper Russian River watershed (i.e., Forsythe Creek watershed) (CNDDB 2023). Potentially suitable habitat does occur throughout the Planning Area, including within the proposed expanded SOI, but such habitat is limited within the incorporated City limits.
Trifolium hydrophilum (saline clover)	NA	NA	1B.2	G2	S2	Annual clover associated with vernal pools, mesic valley and foothill grasslands, and other wetland habitats Known Threats: Development, trampling, road construction and maintenance, vehicles, and possibly also by non-native plants	One (1) documented occurrence within the Planning Area, beyond incorporated City limits (CNDDB 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of wet meadows and vernally mesic grasslands or other wetland habitats.

Table Botanical. Special Status Botanical Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each botanical category, taxa are listed alphabetically. Referenced sources of distribution information reflect the results of “positive reporting” methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent “absence” or lack of suitable habitat unless explicitly stated as such with substantiating information.

	Conservation Status Listing and Rank						
Taxa	**FESA***	**CESA†**	**CRPR‡**	**GRank§**	**SRank§**	**Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)**	**Pertinent Distribution**
Wyethia longicaulis (Humboldt County Wyethia)	NA	NA	4.3	G4	S4	Perennial herb found in coastal prairie, broadleaf upland and lower montane coniferous forest; sometimes along roadsides Known Threats: Road maintenance and potentially threatened by vehicles, road construction, and timber harvest activities	Nearest documented occurrence records indicate presence within the Willits and adjacent Longvale 7.5-min. USGS quads (CNDDB 2023). Unclear where the occurrence(s) within the Willits quad is/are relative to the incorporated City limits and proposed expanded SOI. Potentially suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI.
Nonvascular Botanical Species							
“Bryophytes” (“Mosses,” “Liverworts,” and “Hornworts”)							
Bruchia bolanderi (“Bolander’s Bruchia”)	NA	NA	4.2	G3	S3	Acrocarpous moss found (often buried) on damp soil in upper and lower montane coniferous forests, meadows and seeps Known Threats: Possibly threatened by fuel reduction projects, trampling, and recreational activities	Nearest documented occurrence records indicate presence within the Willits 7.5-min. USGS quad (CNDDB 2023). Unclear where the occurrence(s) within the Willits quad is/are relative to the incorporated City limits and proposed expanded SOI. Suitable habitat and substrates do occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily in the form of seeps and other mesic areas in forests and meadows.
Lichens							
Dolichousnea longissima (= *Usnea longissima*) (“Methuselah's beard lichen”)	NA	NA	4.2	G4	S4	Epiphytic fruticose lichen typically in more mature trees in broadleaf upland and North Coast coniferous forests Known Threats: Threatened by development, road maintenance, and timber harvest activities	Nearest documented occurrence records indicate presence within the nearby Greenough Ridge 7.5-min. USGS quad to the southwest. (CNDDB 2023). Unclear where the occurrence(s) within the Willits quad is/are relative to the incorporated City limits and proposed expanded SOI. Potentially suitable habitat and substrates do occur within the Planning Area, primarily consisting of forested slopes along the western edge, but unlikely within the incorporated City limits and/or proposed expanded SOI.
Ramalina thrausta (“angel’s hair lichen”)	NA	NA	2B.1	G5?	S2S3	Epiphytic fruticose lichen typically found on dead branches/twigs in North Coast coniferous forests Known Threats: Potentially threatened by air pollution.	Nearest documented occurrence is beyond the Planning Area: ~9 miles to the northwest along Long Valley Creek (CNDDB 2023). Potentially suitable habitat and substrates do occur within the Planning Area, primarily consisting of forested slopes along the western edge, but unlikely within the incorporated City limits and/or proposed expanded SOI.

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	Conservation Status Listing and Rank						
Taxa	**FESA***	**CESA†**	**CRPR‡**	**GRank§**	**SRank§**	**Description (CNPS 2023; Jepson Flora Project 2023; Calflora 2023; Wilson 2023)**	**Pertinent Distribution**
Sulcaria badia ("grooved beard lichen")	NA	NA	4.2	G3	S3	Epiphytic fruticose lichen typically found on trunks and larger branches in cismontane woodland and lower montane coniferous forests; typically on hardwoods, rarely on conifers Known Threats: Potentially threatened by agricultural conversion, development, and wildfire.	Nearest documented occurrence records indicate presence within the nearby Burbeck 7.5-min. USGS quad to the west. (CNDDB 2023). Unclear where the occurrence(s) within the Willits quad is/are relative to the incorporated City limits and proposed expanded SOI. Potentially suitable habitat and substrates do occur within the Planning Area, primarily consisting of forested slopes and oak savannah along the western edge, including within the proposed expanded SOI, and to a lesser extent within the incorporated City limits.

Conservation Status, Listing, and Rarity Rank Designations

***Federal Endangered Species Act (FESA)**

- FE: Federal Endangered
- FT: Federal Threatened
- FPE: Federal Proposed Endangered
- FPT: Federal Proposed Threatened
- FC: Federal Candidate
- FDR: Federal Delisted (Recovered)
- FDE: Federal Delisted (Extinct)

†California Endangered Species Act (CESA)

- SE: State Endangered
- ST: State Threatened
- SCE: State Candidate Endangered
- SCT: State Candidate Threatened
- SR: State Rare
- SDR: State Delisted (Recovered)
- SDE: State Delisted (Extinct)
- SNR: State Not Reviewed

‡California Rare Plant Rank (CRPR)

- 1A: Presumed extirpated in CA and rare or extinct elsewhere
- 1B: Rare or endangered in CA and elsewhere
- 2A: Presumed extirpated in CA but more common elsewhere
- 2B: Rare or endangered in CA but more common elsewhere
- 3: Plants which need more information to evaluate – a review list
- 4: Plants of limited distribution – a review list

Threat Rank:

- .1 – Seriously threatened in CA (over 80% of occurrences threatened, high degree of immediacy of threat)
- .2 – Moderately threatened in CA (20-80% of occurrences threatened, moderate degree of immediacy of threat)
- .3 – Not very threatened in CA (<20% of occurrences threatened, low degree of immediacy of threat/no current threat known)

§Global (G) / State (S) / Infraspecific Trinomial Taxon (T) Rarity Ranks (NatureServe Conservation Status Ranks)

- G/S/T—X: Presumed extinct or eliminated; not located despite extensive, focused search efforts
- G/S/T—H: Possibly extinct or eliminated; known only from historic records, but with the potential for rediscovery
- G/S/T—1: Critically imperiled, due to extreme rarity (often 5 or fewer occurrences) and because of factors making it especially vulnerable to extirpation
- G/S/T—2: Imperiled, due to rarity, very restricted range, very few occurrences (20 or fewer), steep declines
- G/S/T—3: Vulnerable, due to restricted range, populations 80 and fewer, recent declines
- G/S/T—4: Apparently secure, but with cause for long-term concern due to declines or other factors
- G/S/T—5: Secure, due to common or widespread abundance
- Q: Questionable taxonomy that may reduce conservation priority
- ?: Inexact numeric rank

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* Federal Endangered Species Act (1973 as amended)
† California Endangered Species Act (1970 as amended)
‡ California Native Plant Society (CNPS) Rare Plant Ranks (CNPS 2023b)
§ NatureServe (“Heritage Method”) Conservation Status Ranks (NatureServe 2023)

Table Wildlife. Special Status Fish and Wildlife Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each category, taxa are listed alphabetical order. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Mollusks							
Anodonta californiensis (= *Anodonta nuttalliana* [Bieler 2015]) (California Floater)	NA	NA	NA	G3Q	S2?	Generally in shallow water, freshwater lakes and slow-moving streams and rivers with mud or sand substrates; typically found under submerged logs and vegetation. Reaches sexual maturity at 4–5 years and may live 10–15 years. Somewhat tolerant of lower dissolved oxygen and higher nutrient concentrations. Like other freshwater mussels, they require suitable host fish to complete life cycle. Taxonomy under review. Threats: Stream diversions, in-stream construction, in-stream barriers affecting host fish species, pollution and water quality degradation, competition from invasive aquatic invertebrates, and climate change.	Nearest documented occurrence records indicate presence (only at the quad-level) within the adjacent Foster Mountain 7.5-min. USGS quad to the east of the Planning Area and in the Tan Oak Park quad north of Laytonville (CNDDB 2023). Additional ["research grade"] occurrence reports also exist from the Tomki Creek watershed, north of the Planning Area (iNaturalist 2023). Potentially suitable habitat does occur within the Planning Area, including within the incorporated City limits and the proposed expanded SOI. Such habitat primarily consists of stream channels and any associated in-stream impoundments.
Insects							
Bombus caliginosus (Obscure Bumble Bee)	NA	NA	NA	G2G3	S1S2	Grassy coastal areas (including coast range mountains) or shrublands from Santa Barbara county, CA north to southern British Columbia, with some records from California's Central Valley (CNDDB 2023, Xerces Society 2023). Queens overwinter underground and emerge in early spring to mate and nest underground or occasionally above ground in abandoned bird nests, grass tufts, or other similar cavities. Food plant genera include *Baccharis*, *Ceanothus*, *Cirsium*, *Grindelia*, *Keckiella*, *Lathyrus*, *Lotus*, *Lupinus*, *Phacelia*., *Rubus*, *Trifolium*, etc. (Williams et al. 2014; etc.). Threats: Development, pesticides, pollution, some agricultural practices, wildfire, and climate change.	Nearest documented occurrence records indicate historic collections from near Ryan Creek just north of the Planning Area and Longvale, ~6 miles north of the Planning Area (CNDDB 2023). Well-drained upland grassland habitats and shrublands throughout the Planning Area, including the proposed expanded SOI, and to a lesser extent the within the incorporated City limits, provide suitable nesting and overwintering habitat for this species. During the blooming season, abundant foraging habitat also occurs throughout the Planning Area.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Bombus occidentalis (Western Bumble Bee)	NA	SCE	NA	G3	S1	Once common and widespread, this species has declined precipitously (~40%) from central CA to southern British Columbia, possibly due (in part) to disease. Listed as "imperiled" by the Xerces Society (2023). Generalist foragers, often in open grassy areas, urban/parklands, chaparral/shrub lands and mountain meadows. Queens overwinter underground and emerge between mid-March and mid-April to mate and nest. Nesting habitat typically consists of well-drained grasslands with cavities and holes, such as those created by burrowing rodents (Mesler pers. comm.). Threats: Development, pesticides, pollution, some agricultural practices, wildfire, disease, and climate change.	Two (2) documented occurrences within the Planning Area: one (1) overlaps both the existing incorporated City limits and that of the proposed expanded SOI and another overlaps the northern extent of the Planning Area in the vicinity of Ryan Creek (CNDDB 2023). Well-drained upland grassland habitats with abundant rodent burrows occur throughout the Planning Area, including the proposed expanded SOI, and to a lesser extent the within the incorporated City limits, and provide suitable nesting and overwintering habitat for this species. During the blooming season, abundant foraging habitat also occurs throughout the Planning Area.
Danaus plexippus plexippus (Pop. 1) (Western Monarch)	FC	NA	NA	G4T1T2Q	S2	Monarchs reproduce and disperse in spring and summer, producing multiple generations, whose adults only live for 2–6 weeks. In this region, egg-laying and caterpillar development only occur on milkweed (*Asclepias* spp.). Adults migrating to overwintering sites in autumn enter non-breeding diapause and live throughout the winter (~6–9 months). Migratory routes typically follow river systems and associated riparian corridors and the species overwinters from (late September) October through late February–March in dense groups in trees at low-elevation, humid coastal sites protected from freezing from Mendocino County, California south to Baja California (Mexico). In recent years, however, this overwintering range has contracted and occupancy at latitudinal extremes of their historic overwintering range has become rare. Threats: Loss of milkweed (*Asclepias* spp.) breeding habitat due in large part to widespread and indiscriminate herbicide application, insecticides, development and land conversion, timber harvest activities and other habitat degradation at overwintering sites, and climate change.	Nearest documented overwintering site records are within the Elk 7.5-min. USGS quad, ~23 miles to the southwest of the Planning Area along the coast (CNDDB 2023). Recent (Sept., Oct. 2023) ["research grade"] records of breeding also exist within the incorporated City limits and elsewhere within the Planning Area (iNaturalist 2023). At least two milkweed species are known from within the Planning Area: *Asclepias fascicularis* (narrow-leaf milkweed) and *Asclepias speciosa* (showy milkweed) (Calflora 2023) and the latter has been documented within the incorporated City limits (iNaturalist 2023). Another milkweed species, *Asclepias eriocarpa* (kotolo), is known to occur just beyond the Planning Area to the east. It is likely that all three milkweed species occur elsewhere within the incorporated City limits, within the proposed expanded SOI, and elsewhere in the Planning Area where suitable habitat occurs.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Fish							
Entosphenus tridentatus (Pacific Lamprey)	NA	NA	SSC	G4	S3	Ancient, anadromous fish from the north Pacific Ocean and tributary drainages which, as adults are parasitic on a variety of marine and other anadromous fish species. Spends 1–3 years at sea before migrating into freshwater rivers and streams in February–June where they are believed to spend another year before spawning from March–July in gravel/cobble substrates. Eggs hatch into immature “ammocoetes,” which drift downstream to areas of low flow velocity and burrow into fine substrates where they persist as filter feeders on diatoms and algae until they reach sexual maturity after 3–7 years and emigrate to the ocean between fall and spring. Thought to historically have been distributed wherever salmon and steelhead also occurred, but their distribution and abundance more recently are declining. Threats: Passage barriers (e.g., tide gates, culverts, in-stream diversions, etc.), stream channel dewatering events, in-stream construction and channel simplification, pollution and water quality degradation, predation by non-native fish species, and climate change.	Documented within the Planning Area in Outlet Creek (Goodman 2021) as well as elsewhere throughout the Mainstem, Middle Fork, North Fork, and South Fork Eel River system (Goodman 2021; CNDDB 2023; pers. obs.; etc.). Potentially suitable spawning, rearing, and migratory habitat exists within the Planning Area, including within the incorporated City limits and proposed expanded SOI. Such habitat includes portions of the various tributaries of Outlet Creek, including Willits, Mill, Broaddus, Baechtel, Haehl, Upp, Berry, and Davis Creeks.

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	Conservation Status Listing and Rank						
Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Oncorhynchus kisutch (Pop. 2) (Coho Salmon—Southern OR/Northern CA ESU) Primary identified threats to Middle Mainstem Eel River Coho include: extreme hydrologic events (e.g., drought- or diversion-related low flows adversely affecting migration and rearing, flooding such as that associated with atmospheric river events scouring away or burying redds, etc.); reduced access to floodplain habitats; channel simplification and reduced channel habitat complexity (due in large part to reduced availability of large wood features in streams); dams and other passage barriers; reduced summer baseflows due to inadequate bypass stream flow around instream reservoirs as well as stream diversions associated with *Cannabis* cultivation and rural residential development; road-generated fine sediment and pollution; elevated water temperatures; disease; and predation/competition from invasive species (e.g.; Sacramento Pikeminnow, *Ptychocheilus grandis*; New Zealand Mudsnail, *Potamopyrgus antipodarum*; etc.).	FT	ST	NA	G5T2Q	S2	Anadromous fish in the north Pacific Ocean and tributary drainages. In California, their range historically extended south from the Oregon border to the streams of Monterey Bay. The Southern OR/Northern CA Evolutionarily Significant Unit (ESU) includes that portion of the [naturally spawning] population inhabiting rivers and streams emptying into the Pacific Ocean between Cape Blanco (Oregon), south to Punta Gorda (California). Adults return to freshwater during September–January to migrate upstream with increased winter flows and spawn in smaller streams with well-aerated, medium to small gravel substrates. Fertilized eggs incubate in gravels from November–April and hatchlings remain in interstitial spaces until they emerge as fry through ~July. Rearing of juveniles occurs in estuaries or low-gradient coastal streams, sloughs and side-channels. After developing for ~one year, smolts migrate to the ocean typically during March–April where they remain for 1–2 years before returning to natal freshwater streams to spawn and die. The Middle Mainstem Eel River [Coho] Population, which includes individuals inhabiting that portion of the mainstem Eel River watershed extending upstream from its confluence with the Middle Fork Eel at Dos Rios to its confluence with Tomki Creek, as well as the entirety of the Outlet Creek watershed, is considered to have a “High Extinction Risk” (NMFS 2014), and the minimum number of spawners required for ESU viability is estimated to be 6,300 (NMFS 2014).	Outlet Creek was historically considered to be the largest producer of coho salmon within the Middle Mainstem Eel River [Coho] Population (NMFS 2014). The California Department of Fish and Game identified the portion of the Coho population found within the upper tributaries of Outlet Creek to be one of the longest migrating populations of Coho in California (CDFG 2004), a life history strategy that National Marine Fisheries Service characterized as being, “unique to the Eel River basin and important to the long-term survival and recovery of the SONCC coho salmon ESU as well as to the Interior Eel River Diversity Stratum” (NMFS 2014). Within the Planning Area, including within the incorporated City limits and proposed expanded SOI, much of Outlet, Mill, Willits, Broaddus, and Baechtel Creeks, as well as ~1 mile of Haehl Creek are included within the mapped distribution of Coho (Christy 2022), and spawning records for Coho exist from the late 80s/early 90s for Outlet, Willits, Broaddus, and Baechtel Creeks (Brown and Moyle 1991 *in* NMFS 2014), as well as from 2007/2008 in Mill and Willits Creeks (Harris *in* NMFS 2014). Corroborating intrinsic potential models for Coho reflect “high” (0.66–1.0) potential throughout most reaches of Outlet Creek tributaries within the Planning Area (Williams et al. 2006 *in* NMFS 2014).

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	Conservation Status Listing and Rank						
Taxa	**FESA***	**CESA[†]**	**CDFW[‡]**	**GRank[§]**	**SRank[§]**	**Description**	**Pertinent Distribution**
Oncorhynchus mykiss irideus (Pop. 48) (Steelhead—Northern CA DPS, "Summer-Run") Primary identified threats to the Northern California Steelhead DPS include: extreme hydrologic events (e.g., drought- or diversion-related low flows adversely affecting migration and rearing, flooding such as that associated with atmospheric river events scouring away or burying redds, etc.); reduced access to floodplain habitats; channel simplification and reduced channel habitat complexity (due in large part to reduced availability of large wood features in streams); dams and other passage barriers; reduced summer baseflows due to inadequate bypass stream flow around instream reservoirs as well as stream diversions associated with *Cannabis* cultivation and rural residential development; road-generated fine sediment and pollution; elevated water temperatures; disease; and predation/competition from invasive species (e.g.; Sacramento Pikeminnow, *Ptychocheilus grandis*; New Zealand Mudsnail, *Potamopyrgus antipodarum*; etc.).	FT	SE	NA	G5T2Q	S2	Anadromous fish in the north Pacific Ocean and tributary drainages. In California, their range currently extends from the Oregon border to south of Santa Barbara. The Northern CA Distinct Population Segment (DPS) includes that portion of the [naturally spawning] population inhabiting rivers and streams emptying into the Pacific Ocean between Redwood Creek (Humboldt County), south to—but not including—the Russian River (Sonoma County). Steelhead exhibit broad life history plasticity. Some juveniles remain in freshwater habitats for one year, while others remain for multiple years (r = 1–4 years) before emigrating as smolts to the ocean where they mature, typically remaining at sea for 2 years though that period ranges from 1–4 years. "Summer-run" ("stream-maturing") Steelhead are sexually immature when they return from the ocean to enter freshwater May–October and must spend several months maturing in freshwater before they spawn during December–March. Emigration to the ocean typically occurs from late winter–early summer. Optimal freshwater habitat conditions for Steelhead include: channel complexity, adequate stream flow, suitable water temperatures, unimpeded passage, adequate quantities of clean spawning gravel, and access to low velocity overwintering habitat during high flow events. Where all three species occur, typical suitable Steelhead habitat extends further upstream than for Coho and Chinook Salmon.	The nearest known population of summer-run Steelhead is in the Upper Middle Mainstem Eel River, upstream of its confluence with Outlet Creek. Potentially suitable spawning, rearing, and migratory habitat does exist within the Planning Area, including within the incorporated City limits and the proposed expanded SOI, however, Outlet Creek and its tributaries are not believed to have supported a summer-run population of Steelhead historically.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Oncorhynchus mykiss irideus (Pop. 49) (Steelhead—Northern CA DPS, "Winter-Run") Primary identified threats to the Northern California Steelhead DPS include: extreme hydrologic events (e.g., drought- or diversion-related low flows adversely affecting migration and rearing, flooding such as that associated with atmospheric river events scouring away or burying redds, etc.); reduced access to floodplain habitats; channel simplification and reduced channel habitat complexity (due in large part to reduced availability of large wood features in streams); dams and other passage barriers; reduced summer baseflows due to inadequate bypass stream flow around instream reservoirs as well as stream diversions associated with *Cannabis* cultivation and rural residential development; road-generated fine sediment and pollution; elevated water temperatures; disease; and predation/competition from invasive species (e.g.; Sacramento Pikeminnow, *Ptychocheilus grandis*; New Zealand Mudsnail, *Potamopyrgus antipodarum*; etc.).	FT	NA	NA	G5T3Q	S3	Anadromous fish in the north Pacific Ocean and tributary drainages. In California, their range currently extends from the Oregon border to south of Santa Barbara. The Northern CA Distinct Population Segment (DPS) includes that portion of the [naturally spawning] population inhabiting rivers and streams emptying into the Pacific Ocean between Redwood Creek (Humboldt County), south to—but not including—the Russian River (Sonoma County). Steelhead exhibit broad life history plasticity. Some juveniles remain in freshwater habitats for one year, while others remain for multiple years (r = 1–4 years) before emigrating as smolts to the ocean where they mature, typically remaining at sea for 2 years though that period ranges from 1–4 years. "Winter-run" ("ocean-maturing") Steelhead are sexually mature when they return from the ocean to enter freshwater November–April and spawn shortly thereafter. Emigration to the ocean typically occurs from late winter–early summer. Optimal freshwater habitat conditions for Steelhead include: channel complexity, adequate stream flow, suitable water temperatures, unimpeded passage, adequate quantities of clean spawning gravel, and access to low velocity overwintering habitat during high flow events. Where all three species occur, typical suitable Steelhead habitat extends further upstream than for Coho and Chinook Salmon.	Winter-Run Steelhead of the Northern California DPS do occur and reproduce in the tributaries of Outlet Creek. The Outlet Creek population is part of the Lower Interior Diversity Stratum and is considered an Essential (Independent) Population within the recovery context for that species' DPS (Bjorkstedt et al. 2005 *in* NMFS 2016). The respective recovery abundance population target for Outlet Creek is ≥3,800 spawners (NMFS 2016). CDFW (*in* NMFS 2016) found that 88% of larger Outlet Creek tributaries were inhabited by Steelhead; which is estimated to represent <50% of historic habitat likely used by the species (Spence et al. 2012 *in* NMFS 2016). LeDoux-Bloom and Downie (2007 *in* NMFS 2016) characterized stream habitat suitability for Steelhead as "medium" quality in Outlet, Willits [Mill], Broaddus, and Baechtel Creeks. They also reported that Willits [Mill] Creek exhibited cooler water temperatures (attributed to the extent of forest along its riparian corridor), whereas Outlet, Baechtel, Broaddus, and Davis Creek stream temperatures were "marginal to unsuitable" when and where sampled. Modeled intrinsic potential for the Northern California Steelhead DPS is moderate (0.35–0.69) throughout Outlet Creek and associated tributaries within the Planning Area, with a segment of middle Baechtel Creek reflecting high (0.7–1.0) intrinsic potential (Bjorkstedt et al. 2005 *in* NMFS 2016).

Oncorhynchus tshawytscha (Pop. 17) (Chinook Salmon—CA Coastal ESU)	FT	NA	NA	G5T2Q	S2	Anadromous fish in the north Pacific Ocean and tributary drainages. In California, their range extends from the Oregon border south to the streams of San Francisco Bay. The CA Coastal Evolutionarily Significant Unit (ESU) includes that portion of the [naturally spawning] population inhabiting rivers and streams emptying into the Pacific Ocean between—and inclusive of—Redwood Creek (Humboldt County), south to—and inclusive of—the Russian River (Sonoma County). All members of this ESU are currently “fall-run” Chinook. Adults return to freshwater at an advanced stage of reproductive maturity from August–January where they migrate to spawn within only a few weeks’ time in clean loose gravel substrates in the mainstem or lower river tributaries. After emerging from redds, juveniles quicky move to estuarine or marine environments the following April–July. After entering the ocean, Chinook spend 2–5 years at sea before returning to natal streams to spawn and die. Primary identified threats to the California Coastal Chinook ESU include: extreme hydrologic events (e.g., drought- or diversion-related low flows adversely affecting migration and rearing, flooding such as that associated with atmospheric river events scouring away or burying redds, etc.); reduced access to floodplain habitats; channel simplification and reduced channel habitat complexity (due in large part to reduced availability of large wood features in streams); dams and/or other passage barriers; stream diversions; road-generated fine sediment and pollution; elevated water temperatures; disease; and predation/competition from invasive species (e.g.; Sacramento Pikeminnow, *Ptychocheilus grandis*; New Zealand Mudsnail, *Potamopyrgus antipodarum*; etc.).	California Coastal ESU Chinook are known to occur within Outlet Creek and its tributaries within the Planning Area, including the incorporated City limits and proposed expanded SOI. Chinook in the Outlet Creek watershed are identified as being part of the North Mountain-Interior Diversity Stratum within the Upper Eel River population, which is considered an Essential (Independent) Population within the recovery context for that species’ ESU (Bjorkstedt et al. 2005 *in* NMFS 2016). The respective recovery abundance population target for the Upper Eel River population is ≥10,600 spawners (NMFS 2016). Modeled intrinsic potential for the California Coastal Chinook ESU is high (0.7–1.0) within the mainstem Outlet Creek but decreases to moderate (0.35–0.69) throughout the rest of the watershed upstream (Bjorkstedt et al. 2005 *in* NMFS 2016). The Outlet Creek watershed and associated tributaries were identified as a priority restoration reach within the Upper Eel River hydrologic unit as part of the general recovery strategy for the species (NMFS 2016), where recommended actions included: improving habitat complexity, restoration and improvement of fish passage, increasing riparian canopy cover and large woody debris availability, and reducing road-based sediment delivery to streams, among others.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Amphibians							
Rana aurora (Northern Red-legged Frog)	NA	NA	SSC	G4	S3	Inhabits humid forests, woodlands, grasslands, diked former tidelands, dune hollows, and stream banks in northwest California and the Pacific Northwest, often near dense riparian cover. Breeds in standing water in vegetated permanent wetlands and seasonal pools that persist long enough for completion of larval development (3–5 months), typically from late fall–early spring. Usually found near permanent water but can occur far from water in damp woods and meadows during the non-breeding season. Threats include habitat loss, water quality degradation, the introduction of the non-native American Bullfrog (*Lithobates catesbeianus*), introduced pathogens, and climate change.	Nearest documented occurrence records are from ~9 miles to the southwest of the Planning Area from the Big River watershed in the Comptche 7.5-min. USGS quad (CNDDB 2023). Potentially suitable habitat does occur within the Planning Area, including within the incorporated City limits and the proposed expanded SOI. Such habitat primarily consists of wetlands, stream channels, ponds, and associated riparian habitats.
Rana boylii (Foothill Yellow-legged Frog) (Pop. 1 — North Coast DPS)	NA	NA	SSC	G3T4	S4	Found in a variety of inland riparian habitats including broad exposed river bars with a rocky substrates, partly-shaded streams and riffles, and freshwater wetlands, but can also occur far from water in damp woods and meadows outside of the breeding season. Typically not found within the fog belt of the immediate coast. Breeds in moderately shallow streams and river margins with dependable streamflow. Egg masses are usually attached to the downstream side of small boulders, large cobble–gravel substrates, or submerged vegetation. Larval development typically ranges 3–4 months. Threats include water quality degradation, hydroperiod alteration (associated with reservoir management actions and/or stream diversions), habitat loss, the introduction of the non-native American Bullfrog (*Lithobates catesbeianus*), introduced pathogens, and climate change.	One (1) documented occurrence within the incorporated City limits near the confluence of Broaddus and Baechtel Creeks, and numerous others in the vicinity of the Planning Area (CNDDB 2023; iNaturalist 2023; etc.). Suitable habitat occurs throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily consisting of stream corridors and adjacent riparian vegetation.

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Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Taricha rivularis (Red-bellied Newt)	NA	NA	SSC	G2	S2	Typically nocturnal or crepuscular during their terrestrial phase, but transition to being aquatic and active day and night during the breeding season. Breeds in rocky streams and rivers with moderate–fast flows February–May. Avoids ponds, lakes, and similar lentic aquatic habitats. Larval development is temperature dependent and ranges 4–6 months. Juveniles are thought to primarily be fossorial until they reach sexual maturity at 4–6 years. Threats include impacts to stream flows and water quality, loss of forest and grassland habitats due to agriculture and development, mortality on roads during breeding season migrations, and climate change.	Two (2) documented occurrences within the Planning Area include one within the incorporated City limits in the Haehl Creek watershed and another within the proposed expanded SOI in the Broaddus Creek watershed (CNDDB 2023). Suitable habitat does occur throughout the Planning Area, including within the incorporated City limits and proposed expanded SOI, primarily along streams and their associated riparian corridors.
Reptiles							
Emys marmorata (Northwestern Pond Turtle)	FPT	NA	SSC	G3G4	S3	Diurnal and aquatic turtle found in ponds, marshes, rivers, streams, irrigation ditches, reservoirs, and canals with aquatic vegetation. Basking sites and suitable nearby upland habitat (e.g., sandy banks or grassy open fields) for egg-laying are critical habitat features, necessary for survival and reproduction. Sexual reproduction isn't reached until 8–10 years of age and breeding typically occurs from April–May (–August). Eggs are laid in terrestrial nests in upland areas adjacent to aquatic habitats with easily excavatable substrates (e.g., sand, etc.). Individuals often overwinter in a state of torpor either underwater or in underground burrows in woodlands or other upland habitats above the reach of high flow events. Threats include trapping and human consumption, wetland drainage and similar forms of habitat conversion, predation by introduced non-native American Bullfrogs (*Lithobates catesbeianus*), competition from introduced non-native turtle species, mortality on roads during breeding season migrations, and climate change.	One (1) documented occurrence beyond the incorporated City limits at Lake Emily—an instream reservoir along Willits Creek, which flows through the Planning Area, incorporated City limits, and proposed expanded SOI (CNDDB 2023). Suitable habitat does occur within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area along ponds, impoundments, aquatic features of natural origin and their associated upland riparian areas.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Birds							
Accipiter atricapillus (Recently separated from *A. gentilis*) (Northern Goshawk)	NA	NA	SSC	G5	S3	Largest North American accipiter occupies a diversity of habitats but prefers mature forests on moderate slopes with open understories and large trees. Typically nests in largest trees within nesting stands, and both conifer and hardwood species may be used. Prey range from large passerines, grouse, and corvids to rabbits and tree squirrels. Primary published threats are attributed to timber harvest activities, though increased incidences of landscape-level wildfire-related stand replacement events could also be an emerging threat.	Nearest documented breeding records include one (1) from ~3 miles east of the Planning Area within the Willits 7.5-min USGS quad near the headwaters of a tributary to Tomki Creek (eBird 2023), and three (3) separate occurrences in the upper mainstem Eel River watershed, each ~12–14 miles east-southeast of the Planning Area (CNDDB 2023). Potentially suitable nesting habitat with some mature forest and larger trees may occur within the incorporated City limits near Morris Dam along Davis Creek and near the Willits Municipal Airport, as well as along forested slopes within the proposed expanded SOI, and similar habitats elsewhere in the Planning Area.
Accipiter cooperi (Cooper's Hawk)	NA	NA	WL	G5	S4	Occurs in open or marginal woodlands and nests in both conifer and hardwood tree species. One analysis found that in California, oaks are the most common nest tree species (Asay 1987). Commonly utilizes urban areas and has successfully nested in ornamental trees. Typical prey species include small to medium-sized songbirds, doves, and small mammals. Primary threats include mortality related to collisions with anthropogenic objects (≤70% [Boal and Mannan 1999]) as well as reductions in prey species for various reasons primarily attributed to habitat conversion throughout wintering, migratory, and breeding ranges. Depredation of prey species by domestic or feral cats may also be a contributing factor to declines in prey species abundance.	No documented records of definitive breeding Cooper's Hawks were encountered in our research of the immediate vicinity of the Planning Area, although one (1) indication of possible breeding just outside the Planning Area to the west of Centennial Dam along Davis Creek (eBird 2023) is noteworthy. Numerous non-breeding observations of the species have been recorded within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area (eBird 2023) and nesting is likely in suitable forested habitat therein. Potentially suitable forested nesting habitat occurs throughout the Planning Area and proposed expanded SOI, and to a lesser extent with the incorporated City limits. Ample foraging habitat along riparian corridors and other forested areas also occurs throughout the Planning Area.

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	Conservation Status Listing and Rank						
Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Accipiter striatus (Sharp-shinned Hawk)	NA	NA	WL	G5	S4	Highly specialized predator of smaller birds, such prey comprise ~90% of diet, with small mammals, frogs and insects making up the balance. Occupies dense to semi-open montane coniferous, deciduous, or mixed forests, and tends to prefer riparian habitats. Nests in conifers, oaks, maples, etc. within in small stands of conifers with dense foliage, typically within 275 feet of water. Primary threats include mortality related to vehicles and window strikes near bird feeders as well as reductions in prey species for various reasons primarily attributed to habitat conversion throughout wintering, migratory, and breeding ranges. Depredation of prey species by domestic or feral cats is likely also a contributing factor to declines in prey species abundance.	Nearest documented breeding records are from ~3 miles west of the Planning Area within the Burbeck 7.5-min USGS quad near the headwaters of Noyo River (CNDDB 2023) and potentially just outside the Planning Area to the west of Centennial Dam along Davis Creek (eBird 2023), though numerous additional non-breeding observations of the species have also been recorded within the incorporated City limits and elsewhere throughout the Planning Area (eBird 2023). Potentially suitable forested nesting habitat occurs throughout the Planning Area and proposed expanded SOI, and to a lesser extent with the incorporated City limits. Ample foraging habitat along riparian corridors and other forested areas also occurs throughout the Planning Area.
Ammodramus savannarum (Grasshopper Sparrow)	NA	NA	SSC	G5	S3	Small, inconspicuous sparrow of grassland habitats. Consumes insects and seeds and nests on the ground in domed grass and other herbaceous vegetation tufts, or occasionally shrubs. Primary threats include conversion of grassland habitats, habitat degradation due to over-grazing, and direct mortality related to agricultural practices in breeding habitat during the breeding season (e.g., mowing, etc.).	Breeding has been documented within the Planning Area (eBird 2023) and additional records of potentially breeding individuals from suitable nesting habitat elsewhere within the Planning Area during the breeding season have also been reported (eBird 2023). Additional breeding records exist within the Purdy's Garden and Garberville 7.5-min. USGS quads, ~24 miles to the southeast and ~50 miles to the northwest, respectively (CNDDB 2023; pers. obs.). Suitable nesting habitat occurs throughout the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Aquila chrysaetos (Golden Eagle)	NA	NA	FP	G5	S3	One of the world's largest birds of prey, Golden Eagles occupy a wide variety of habitats. Most nest site descriptions from western North America are from cliffs, though large trees are also used where exposed rock faces and outcrops are less abundant across the landscape due to vegetation cover, and trees provide suitable nest platform characteristics. Some ground nests have also been described. Primary prey consists of medium-sized birds and mammals such as rabbits, hares, ground squirrels, and prairie dogs, though they are known to take prey as large as wild ungulates (occasionally even domestic livestock). Also known to scavenge for carrion. Threats: Primary published threats include habitat conversion and climate change, lead and other chemical poisoning from contaminated carrion or prey, wind turbine collisions, electrocution from perching on uninsulated power conductors, and the illegal take associated with black-market for cultural/religious items. Most North American populations are declining or below carrying capacity.	Nearest available breeding records in CNDDB (2023) are 38 miles to the north of the Planning Area in the mainstem Eel River watershed and two (2) others ~38 miles to the southeast of the Planning Area, though at least one other breeding pair is known from ~30 miles north of the Planning Area, also in the mainstem Eel River watershed (pers. obs.). Numerous other non-breeding observations have been documented within the Planning Area (eBird 2023). Potentially suitable nesting habitat occurs throughout the Planning Area, but is limited within the proposed expanded SOI, and all but absent within the incorporated City limits.
Ardea herodias (Great Blue Heron)	NA	NA	NA	G5	S4	Occurs widely in lakes, ponds, sloughs, rivers, marshes, and other wetland habitats, and feeds on fish, amphibians, invertebrates, reptiles, small mammals, and even other birds. Nests in close proximity to foraging habitat, typically colonially in rookeries with other nesting pairs, but also as single pairs. Nest building is usually at height in trees but can also be found on cliffsides or on the ground where predator pressures are low. Threats have historically included poisoning of prey species and habitats by industrial contaminants and anthropogenic hunting for feather plumes. Primary threats at present consist of wetland conversion and habitat loss, and from human disturbance, particularly at breeding sites.	Nearest documented breeding records are from ~20 miles west-northwest of the Planning Area near the mouth of Ten Mile River and ~25 miles southeast of the Planning Area near Clear Lake (CNDDB 2023). Some observations within the Planning Area have been documented during the breeding season (eBird 2023). Potentially suitable nesting and foraging habitat occurs within the incorporated City limits, proposed expanded SOI, and elsewhere within the Planning Area, primarily associated with riparian corridors and wetland habitats.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Chaetura vauxi (Vaux's Swift)	NA	NA	SSC	G5	S2S3	Breeds (typically colonially) in preexisting cavities in larger trees created by decay, fire, or natural excavators such as woodpeckers. Nesting stand forest types are typically conifer-dominated, and nest trees are typically conifers, though nests in some hardwood species within such forest types are also known. Will occasionally use chimneys in towns and cities. Migratory roost sites are similar to those described for breeding. Forages for flying insects in forest openings, burned-over forest, meadows, rivers, lakes, and suburban development. Primary threats are related to loss of nesting habitat (i.e., larger, older trees) through forest management practices that do not also prioritize adequate retention of larger and/or senescent trees (e.g., fuels management and forest “health” projects, some commercial timber harvest strategies, etc.). Loss of such habitat due to climate change and increasing incidence of high-intensity wildfire is also a concern.	Nearest documented breeding records are from ~13 miles southwest of the Planning Area in the Navarro 7.5-min. USGS quad (CNDDB 2023). Some observations within the Planning Area have been documented during the breeding season (eBird 2023). Potentially suitable nesting and roosting habitat occurs within the incorporated City limits, proposed expanded SOI, and elsewhere within the Planning Area, primarily consisting of more mature forested habitats with Douglas-fir (*Pseudotsuga menziesii*) and/or coast redwood (*Sequoia sempervirens*) component, though unused chimneys in urban contexts cannot be ruled out.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Coccyzus americanus occidentalis (Western Yellow-billed Cuckoo)	FT	SE	NA	G5T2T3	S1	Prefers riparian forests along broad river flood-plains but can also occur in isolated habitat patches and narrow riparian "stringers." Nest stands vary with habitat conditions and plant species composition throughout the species' range, but they often nest in dense and structurally complex mixed willow (*Salix* spp.) and cottonwood (*Populus* spp.) thickets, with an understory of blackberry (*Rubus* spp.), wild grape (Vitis spp.), etc. Various successional stages of woody riparian vegetation may be important habitat components. Capable of very short breeding periods. Nest construction can be as short as 2–3 days and first egg is often laid prior to completion of nest building. Period between egg laying–fledging ranges from 18–20 days. Diet is primarily composed of large insects, and occasionally, arboreal frogs and lizards. Also known to consume eggs/young of other birds and, on wintering grounds, fruits and seeds. Threats include collisions with anthropogenic structures such as windows, vehicles, and towers, but primary threats include loss of riparian forest habitat and pesticide exposure, both direct exposure where nesting habitat interfaces with orchards (e.g., English walnuts, etc.) as well as loss of insect prey abundance and diversity resulting from widespread insecticide use.	Nearest documented breeding season occurrence records are from ~23 miles southwest of the Planning Area near the Navarro River estuary (eBird 2023), ~42 miles southeast of the Planning Area near Clearlake, ~63 miles to the east of the Planning Area along the Sacramento River, and ~90 miles northwest of the Planning Area near the Eel River estuary (CNDDB 2023). Potentially suitable forested nesting habitat occurs within the incorporated City limits, proposed expanded SOI, and elsewhere within the Planning Area, primarily associated with forested riparian corridors, particularly where willow (*Salix* spp.) and/or cottonwood (*Populus* spp.) are present.
Elanus leucurus (White-tailed Kite)	NA	NA	FP	G5	S3S4	A regular local resident and breeder in northern California, they primarily hunt small mammals (e.g., voles, etc.), but are also known to consume birds, lizards, and insects. Forages in open grasslands, meadows, oak woodlands, wetlands, and agricultural habitats with ungrazed patches. Perches and nests in dense portions of the upper crowns of solitary trees or in similar canopy positions within contiguous forest stands, often near forest/grassland edges or other similar habitat transitions. Threats are primarily attributed to the loss of nesting and foraging habitats and anthropogenic disturbances during the breeding season.	At least five (5) documented breeding records exist from within the Planning Area, one (1) of which is from within the incorporated City limits (eBird 2023). Numerous other breeding-season observations within the Planning Area have also been documented, including from within the proposed expanded SOI (eBird 2023). Suitable nesting and foraging habitat (as described) occurs within the incorporated City limits, proposed expanded SOI, and elsewhere within the Planning Area.

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Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Empidonax traillii brewsteri (Willow Flycatcher)	NA	SE	NA	G5T3T4	S3	Neotropical migratory flycatcher that inhabits riparian areas associated with rivers, streams, and wetlands. Typically breeds in habitats where willows (*Salix* spp.) are well represented. In addition to classic riparian stands and "stringers," occupied sites in northern California and southern Oregon have included beaver meadows, regenerating clear cuts, and mesic openings in coniferous forests where willows (*Salix* spp.) are present. Primary threats are attributed to habitat loss and degradation related to urbanization and over-grazing of wetland and riparian habitats, as well as alteration/interruption of natural hydrological regimes (e.g., stream diversions, channelization, de-watering, dam-related inundation, etc.). Parasitism of other subspecies (i.e., *E. t. extimus*) by Brown-headed Cowbirds (*Molothrus ater*) has also been reported to be a significant threat.	At least two (2) records of potential breeding behavior exhibited by *E. traillii* within suitable habitat during the breeding season exist within the incorporated City limits (eBird 2023). Sporadic other non-breeding-season observations have also been reported elsewhere within the Planning Area (eBird 2023). Suitable nesting habitat occurs within the incorporated City limits, proposed expanded SOI, and elsewhere within the Planning Area, primarily associated with forested riparian corridors, particularly where willow (*Salix* spp.) and/or cottonwood (*Populus* spp.) are present.
Falco peregrinus anatum (American Peregrine Falcon)	FDR	SDR	FP	G4T4	S3S4	Storied falcon, well known for exceptional speeds reached during diving attacks on prey. Primarily hunts medium-sized flocking birds such as shorebirds, seabirds, waterfowl, pigeons, etc., but is also known to take other bird species as well as bats, amphibians, squirrels, insects, and even fish dropped from harassed Osprey (*Pandion haliaetus*). Preferred nesting sites include inaccessible cliffs on rocky outcrops and in river gorges, but also successfully nests in abandoned Bald Eagle (*Haliaeetus leucocephalus*) nests as well as on human-made structures such as skyscrapers, electric towers, and channel buoys. Also known to breed in cavities in coast redwood (*Sequoia sempervirens*) trees and snags. Historically threatened by egg collection and trapping for falconry, as well as eggshell thinning resulting from bioaccumulation of pesticides in prey species. Contemporary threats are largely attributed to collision with anthropogenic structures (e.g., building windows; vehicles; aircraft; wind turbines; powerlines, conductors, and guy wires; etc.) and changes in the availability and composition of food resources owing to multiple factors including wetland conversion and similar habitat loss, climate change effects on ocean currents and dependent populations/food webs, etc.	Nearest documented breeding records are from ~8 miles southwest of the Planning Area in the Bailey Ridge 7.5-min. USGS quad and ~16 miles east of the Planning Area in the Lake Pillsbury 7.5-min. USGS quad (CNDDB 2023). Species observations have been documented, both during and outside of the breeding season, throughout the Planning Area (eBird 2023). Potentially suitable nesting habitat is absent within the incorporated City limits and likely limited within the proposed expanded SOI and elsewhere throughout the Planning Area. Such habitat would consist primarily of sheer cliffs or rock outcrops at higher elevations, or possibly cavities or broken-tops in emergent trees within mature Douglas-fir (*Pseudotsuga menziesii*)- and/or coast redwood (*Sequoia sempervirens*)-dominated forest stands.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Haliaeetus leucocephalus (Bald Eagle)	FDR	SE	FP	G5	S3	In forested areas nesting habitat is generally located in stands with at least some old-growth characteristics including varying age classes, stratified canopies, snags and senescent individuals, canopy gaps, and emergent trees. In non-forested habitats ground nests have been documented from cliffs, ridges, and sea stacks with good flight access but limited (terrestrial) predator access. Typically located within one mile of a river, lake, or ocean shore that supports adequate food supply for both nesting and wintering. An opportunistic forager that will consume carrion, Bald Eagles prefer fish, but also prey on shorebirds, seabirds, waterfowl, aquatic mammals, reptiles, amphibians, crustaceans. Historically threatened by shooting and trapping, as well as eggshell thinning resulting from bioaccumulation of pesticides in prey species. Contemporary threats are largely attributed to collision with anthropogenic structures (e.g.; wind turbines; powerlines, conductors, and guy wires; etc.), lead poisoning from prey or carrion, large oil spills, and development and associated habitat loss.	Nearest documented breeding records are from ~4 miles northwest of the Planning Area in the Longvale 7.5-min. USGS quad and both ~10 and ~21 miles east of the Planning Area in the upper mainstem Eel River watershed (CNDDB 2023). Additional observations have also been documented, both during and outside of the breeding season, throughout the Planning Area, including some that could indicate nesting sites nearer to, or within, the Planning Area itself (eBird 2023). Potential nesting habitat within the incorporated City limits is likely too close to human disturbance to be considered "suitable" (given nearby alternative options) but forest structural characteristics within the proposed expanded SOI, and elsewhere throughout the Planning Area could potentially support nesting Bald Eagles.
Icteria virens (Yellow-breasted Chat)	NA	NA	SSC	G5	S4	Prefers areas of dense undergrowth, brambles, thickets and shrubs, including riparian areas, clear cuts, fallow field edges, forest edges and fencerows. Nests are typically built low (< 8 feet), off the ground in dense vegetation, including but not limited to berry brambles (*Rubus* spp.), grape vines (*Vitis* spp.), willows (*Salix* spp.), rose (*Rosa* spp.), dogwood (*Cornus* spp.), etc. Diet is composed primarily of insects and spiders, as well as fruits and berries as the latter mature throughout the season. Populations have declined substantially, primarily due to habitat loss and degradation resulting from direct anthropogenic alteration as well as climate change-related plant community shifts. Habitat loss as a result of increasing incidence of high-intensity wildfire may also be an emerging threat to breeding habitat in some areas. Similarly, fuels reduction projects and eradication efforts targeting invasive vegetation used for nesting (e.g., *Rubus armeniacus*, "Himalayan blackberry") during the breeding season likely also pose a threat to this species.	Breeding has been documented in riparian habitats within the incorporated City limits and the northern portion of the Planning Area (CNDDB 2023). Numerous additional records of potentially breeding individuals from suitable nesting habitat within the incorporated City limits, the proposed expanded SOI, and elsewhere throughout the Planning Area during the breeding season (and beyond) have also been reported (eBird 2023). Suitable nesting habitat does occur within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area, primarily represented by brambles, thickets, and scrub along riparian corridors and within or adjacent to other wetland habitats.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Nycticorax nycticorax (Black-crowned Night Heron)	NA	NA	NA	G5	S4	Forages nocturnally or at dawn/dusk in freshwater and salt marshes, pond edges, mudflats, croplands, and along slow-moving streams. Their opportunistic diet varies widely, and includes fish, leeches, earthworms, insects, aquatic invertebrates, amphibians, reptiles, small mammals, birds, eggs, vegetation, and even carrion and human garbage. Roosts and nests in a variety of locations—including one reported instance of "rubble"—but more often in dense stands of trees, shrubs, or emergent wetland vegetation, as well as occasionally on cliffs, ledges, or on the ground among boulders. Threats include poisoning of food resources and habitats by pesticides and industrial contaminants, wetland conversion and habitat loss, and from human disturbance, particularly at breeding sites.	Nearest confirmed breeding records are from ~5 miles southeast of the Planning Area within the Redwood Valley 7.5-min. USGS quad (CNDDB 2023). At least one other observation from suitable habitat within the Planning Area have been documented during the breeding season (eBird 2023). Potentially suitable nesting and foraging habitat occurs within the incorporated City limits, proposed expanded SOI, and elsewhere within the Planning Area, primarily associated with riparian corridors and wetland habitats.
Pandion haliaetus (Osprey)	NA	NA	WL	G5	S4	Forages over fish-producing lakes, reservoirs, rivers, estuaries, and the open sea coast (Fix and Bezener 2000). Diet is primarily (>99%) composed of fish (Poole and Gill 2023). Roosts and builds large nests on exposed treetops, towers, pilings, or similar structures in close proximity to foraging waters. Regular summer resident and breeder, with some individuals also over-wintering near major feeding areas (Harris 1996). Historically threatened by shooting, trapping, and egg collection; as well as eggshell thinning resulting from bioaccumulation of pesticides in prey species. Contemporary threats are largely attributed to collision with anthropogenic structures (e.g.; wind turbines; powerlines, conductors, and guy wires; etc.), lead poisoning from prey or carrion, large oil spills, and development and associated habitat loss. Declining anadromous fish populations is also a significant threat to this primarily piscivorous bird of prey.	Nearest documented breeding record is from within the Willits 7.5- min. USGS quad (eBird 2023), as well as ~8 miles southeast of the Planning Area near Lake Mendocino (CNDDB 2023), and both ~11 and ~12 miles east of the Planning Area in the upper mainstem Eel River watershed (CNDDB 2023). Additional non-breeding observations have also been documented, both during and outside of the breeding season, throughout the Planning Area (eBird 2023). Potentially suitable nesting habitat (as described) does exist within the proposed expanded SOI and elsewhere throughout the Planning Area, but is limited within the incorporated City limits.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Progne subis (Purple Martin)	NA	NA	SSC	G5	S3	Breeds in riparian and oak woodlands, partially logged, damaged or burned coniferous forests and montane mixed forests, nesting in cavities (usually old woodpecker cavities) of tall trees and snags, often near water (Fix and Bezener 2000). Similar holes in anthropogenic structures such as bridges, overpasses, etc. are also known to be used for nesting, as well as are constructed “bird houses” specifically for nesting Purple Martins. Foraging for flying insects occurs over bottomlands, bays, coastal lagoons, ponds, riparian areas, and other wetland habitats. Primary threats are related to loss of nesting habitat (i.e., larger, older trees) through forest management practices that do not also prioritize adequate retention of larger and/or senescent trees with cavities (e.g., fuels management and forest “health” projects, some commercial timber harvest strategies, etc.). Loss of such habitat due to climate change and increasing incidence of high-intensity wildfire is also a concern. Competition for use of suitable nest cavities from introduced European Starlings (*Sturnus vulgaris*) and House Sparrows (*Passer domesticus*), as well as reductions in prey species abundance due to extensive use of pesticides, particularly neonicotinoid and pyrethroid insecticides, also pose a threat to this species as well.	At least two breeding instances have been documented within the incorporated City limits (eBird 2023), and other observations during the breeding season have been recorded elsewhere within the Planning Area (eBird 2023). Additional confirmed breeding is known in the adjacent Foster Mountain 7.5-min. USGS quad to the east and elsewhere in the region (CNDDB 2023). Suitable nesting habitat (as described) occurs within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.
Setophaga petechia (Yellow Warbler)	NA	NA	SSC	G5	S3	Insectivorous neotropical migratory warbler, inhabits riparian areas associated with rivers, streams, and wetlands. Typically breeds in habitats where willows (*Salix* spp.) are well represented, often also with alder (*Alnus* spp.) and/or cottonwood (*Populus* spp.) species as well. Primary threats are attributed to habitat loss and degradation related to urbanization and over-grazing of wetland and riparian habitats. Parasitism by Brown-headed Cowbirds (*Molothrus ater*) has also been reported to be a significant threat.	Breeding has been documented in riparian habitats within the incorporated City limits and the northern portion of the Planning Area (CNDDB 2023). Numerous additional records of potentially breeding individuals from suitable nesting habitat within the incorporated City limits, the proposed expanded SOI, and elsewhere throughout the Planning Area during the breeding season (and beyond) have also been reported (eBird 2023). Suitable nesting habitat (as described) does occur within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Spinus lawrencei (Lawrence's Goldfinch)	NA	NA	NA	G3G4	S4	Small passerine with strong preferences for native plant seeds such as those of fiddleneck (*Amsinckia* spp.), chamise (*Adenostoma fasciculatum*), etc. Typically nests near water in oak woodlands with abundant epiphytic fruticose lichens, which are regularly incorporated into nest construction, along with grasses, etc. Primary threats include removal/degradation of nesting habitat and native forage plants.	Breeding has been documented within the incorporated City limits (eBird 2023) and additional records of potentially breeding individuals from suitable nesting habitat elsewhere within the Planning Area during the breeding season have also been reported (eBird 2023). Additional breeding records exist within the Redwood Valley 7.5-min. USGS quad to the southeast (CNDDB 2023). Suitable nesting habitat (as described) does occur within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.
Strix occidentalis caurina (Northern Spotted Owl)	FT	ST	NA	G3G4T3	S2	Generally inhabits structurally complex late-seral and old-growth conifer forests for nesting, roosting and foraging, though individuals may visit less complex forest stands during dispersal events and to hunt. Low heat tolerance and the need to reposition often to find favorable microclimate may explain the complex habitat requirements of this species to some extent (Barrows & Barrows 1978). Primary threats include habitat loss, fragmentation, and simplification associated with timber harvest activities and increasing incidence of high-intensity wildfire events, as well as competition, depredation, and interbreeding with introduced Barred Owls (*Strix varia*). Poisoning of prey species with rodenticides and/or other pesticides—particularly as a result of illegal *Cannabis* cultivation in remote areas and throughout the wildland urban interface—has also become an emergent threat.	Three (3) activity centers occur within the Planning Area, near the northern and southern extents, and other activity centers and detections have been documented within 0.5–1 mile to the west of the proposed expanded SOI (CNDDB 2023). Other such detections have also been documented beyond, but in close proximity to, the Planning Area (CNDDB 2023). Some potentially suitable nesting, roosting, foraging, and dispersal habitats (as described) exist within the Planning Area, including within the proposed expanded SOI. Of the aforementioned four types of Northern Spotted Owl habitat, only limited patches of marginal foraging and/or dispersal habitats occur within the incorporated City limits.

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	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Mammals							
Antrozous pallidus (Pallid Bat)	NA	NA	SSC	G4	S3	Occupies a variety of open habitats including grasslands, shrublands, oak savannahs, open coniferous forests, and orchards and vineyards. Can roost alone or in small groups, but typically roosts gregariously in larger groups. Roost sites are typically unobstructed, insulated from temperature extremes, and high above the ground, but exceptions have been documented. Typical roost sites include rock outcrops; caves and mine shafts; tree trunk and bole cavities; exfoliating bark of conifers, oaks, and other deciduous trees; and anthropogenic structures such as bridges, trestles, barns, vacant and occupied buildings, bat boxes, etc. Opportunistic generalist feeders that both glean and hunt on the wing. Their diet consists primarily of insects, but they have been known to take small reptiles and rodents. Mating occurs October–February at primary roosts while overwintering and weaning of young happens when maternal colonies disperse between August–October. Alternate roosts may be used on occasion and roosts may or may not be reused from year to year. Species is not known to migrate long distances between winter and summer sites. Threats include mass displacement when gregarious roosts are destroyed or sufficiently disturbed due to timber harvest activities, wildfire events, demolition of occupied structures, and recreation (e.g., rock-climbing, spelunking, etc.); loss of roosting and foraging habitat due to urbanization and associated development; and reductions in prey species abundance due to widespread applications of insecticides and other pesticides. The fungal infection, "white-nose syndrome," also threatens many bat species.	Nearest documented occurrence records are from within the Willits and adjacent Redwood Valley 7.5- min. USGS quads, as well as others in the vicinity (CNDDB 2023). Potentially suitable roosting and foraging habitat (as described) does exist within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

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	Conservation Status Listing and Rank						
Taxa	**FESA***	**CESA†**	**CDFW‡**	**GRank§**	**SRank§**	**Description**	**Pertinent Distribution**
Arborimus pomo (Sonoma Tree Vole)	NA	NA	SSC	G3	S3	Nocturnal arboreal rodent that primarily inhabits canopies of late-seral or old-growth coniferous or mixed hardwood-conifer forests with a Douglas-fir (*Pseudotsuga menziesii*) component. Douglas-fir needles are this species' primary food source. Known to be more abundant in older forests, they are sometimes found in younger stands. Nests are made in tree cavities, broken tops, epiphyte mats, or in a collection of gathered sticks, twigs, and fruticose lichens. Discarded resin ducts and fresh or picked over Douglas-fir needles and branchlets, as well as distinctive fecal pellets often provide evidence of presence. An important food source for Northern Spotted Owl (*Strix occidentalis caurina*), Humboldt Martin (*Martes caurina humboldtensis*), and Fisher (*Pekania pennanti*), other threats include timber harvest activities, and increasingly, high-intensity wildfire events.	Four (4) occurrences are documented in forested habitats within the Planning Area, with one being within ~0.5 miles of the incorporated City limits and proposed expanded SOI (CNDDB 2023). Potentially suitable habitat (as described) does exist within the Planning Area, including within the proposed expanded SOI. Potentially suitable habitat within the incorporated City limits itself does exist, but is limited.
Bassariscus astutus raptor (Northern California Ringtail)	NA	NA	FP	G5TNR	SNR	Close relative to raccoons and primarily nocturnal, they are dept and agile climbers, and are typically found in forests, woodlands, or rocky habitats. Habitat depending, they den in tree cavities, interstices in boulders, caves, mine shafts, and unoccupied (or little used) anthropogenic structures. Marking latrines often provide unmistakable evidence of presence/occupation. Diet is opportunistic and variable; includes passerine birds, eggs, mice, squirrels, rabbits, amphibians and reptiles, insects, fruits, seeds, and carrion. Published threats reference hunting and trapping for their pelts. Where they overlap with human habitation and agriculture, poisoning from rodenticides and other pesticides may also pose a threat.	Nearest documented occurrence records are from ~10 miles west of the Planning Area in the North Fork Big River watershed (iNaturalist 2023), and within the Laytonville and Dos Rios 7.5- min. USGS quads, ~11 miles north of the Planning Area (CNDDB 2023). Potentially suitable habitat (as described) does exist within oak woodland and other forested or rocky portions of the Planning Area, including the proposed expanded SOI and to a lesser extent within the incorporated City limits. Unused anthropogenic structures in less frequented rural and urban contexts also cannot be ruled out.

Table Wildlife. Special Status Fish and Wildlife Taxa Known From, or That Have Reasonable Potential to Occur Within, the City of Willits Planning Area. Within each category, taxa are listed alphabetical order. Referenced sources of distribution information reflect the results of "positive reporting" methodologies; a lack of occurrence data for any particular resource in any particular location should not be misconstrued to represent "absence" or lack of suitable habitat unless explicitly stated as such with substantiating information.

Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Cervus canadensis nannodes (Tule Elk)	NA	NA	NA	G5T3	S3	Elk can be found in a variety of habitats including grasslands, emergent wetlands, hardwood forests, mixed conifer forests, oak woodlands, and shrublands. They often prefer habitat mosaics or the interface between open grasslands/shrublands with better foraging opportunities and forests where they can quickly find concealment and/or protection. Forests can also provide corridors for seasonal or migratory movements and lowland forests are often important wintering habitats for elk. In regions not subject to regular deep snowfall events, however, Tule Elk tend not to migrate seasonally. Elk are opportunistic herbivores and their diet can vary from grasses and forbs to "browse" (i.e., nutritious tender shoots of woody shrubs and trees) depending upon the season, habitat, and forage availability. The elk breeding season or "rut" typically occurs from August–November, and can extend later for Tule Elk given the warmer temperatures experienced where that subspecies is distributed. Mature bulls often become solitary or separate into small groups after the rut, but herds mostly form combined groups to overwinter. In May–June, cows become solitary to calve in areas of dense, concealing vegetation and bulls that are not already separated from the herd will do so. Threats include illegal hunting, vehicle collisions, fence entanglement, and land management practices that decrease the availability and abundance of shrubs and early-successional browse. Historic fire suppression and over-grazing by domesticated livestock have contributed to senescent shrublands and similar habitats where productivity for native ungulates is inadequate. Exposure to diseases from affected livestock can also pose a threat to co-occurring elk populations as well.	Both Tule Elk (*Cervus canadensis nannodes*) and Roosevelt Elk (*C. c. roosevelti*) occupied California historically, though their abundance and distributions have changed radically since the arrival of Eurasian human populations. Through natural dispersal and intentional translocations, populations of both subspecies are re-establishing and some interbreeding may be occurring where the two interface. The home range of the Little Lake Valley subherd of the Mendocino Tule Elk Management Unit occupies much of the northern portion of the Planning Area, as well as a substantial portion of the northern half of the contiguous incorporated City limits (Hilson 2023). Although the Little Lake Valley subherd is not thought to migrate between traditional summer and winter seasonal ranges, it has been speculated that this subherd may have become established by dispersal from the Sherwood Valley subherd and given the migration potential of the species, some movements and exchange is to be expected, especially as populations continue to grow. Suitable habitat (as described) does exist within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Corynorhinus townsendii (Townsend's Big-eared Bat)	NA	NA	SSC	G4	S2	Occupies a variety of habitats including riparian areas, grasslands, woodlands, coniferous forests, orchards and other agricultural areas. Being moth specialists, their diet is composed almost entirely of Lepidopterans, which they hunt along forest edges and riparian corridors. They are known to travel large distances (> 90 miles) during a single evening while foraging. Can roost alone or in small groups, but typically roosts gregariously in larger groups. Roost use varies within and between seasons and years, but they demonstrate high site-fidelity in areas where roost availability is limited. Typical roost sites include caves and mine shafts; large tree trunk and bole cavities; and anthropogenic structures such as bridges, trestles, barns, vacant and occupied buildings, etc.—though they are highly susceptible to human disturbance. Mating occurs October–February and maternal colonies form May–June. Seasonal movements are poorly understood, though there is some evidence of local migration. Threats include destruction of, or disturbance to, roost sites and hibernacula resulting from timber harvest activities, wildfire events, demolition of occupied structures, and recreation (e.g., rock-climbing, spelunking, etc.); loss of roosting and riparian foraging habitat due to urbanization and associated development; and reductions in prey species abundance due to widespread applications of insecticides and other pesticides. The fungal infection, “white-nose syndrome,” also threatens many bat species.	Nearest documented occurrence records are from within the Willits and three adjacent 7.5-min. USGS quads (i.e., Greenough Ridge, Laughlin Range, and Redwood Valley) (CNDDB 2023). Potentially suitable hibernacula, roosting, and foraging habitat (as described) does exist within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA[†]	CDFW[‡]	GRank[§]	SRank[§]		
Eumops perotis californicus (Western Mastiff Bat)	NA	NA	SSC	G4G5T4	S3S4	Largest bat native to North America with a wingspan of up to ~22 inches, they occupy a variety of open habitats including grasslands, shrublands, oak savannahs, open coniferous forests, chaparral, and desert environments. Unusual among most North American bats, they remain active throughout winter and are thought not to hibernate or migrate. Mating begins in early spring and offspring are born in mid-summer. Colony size is typically < 100 individuals. Roosts occur in rock crevices associated with outcrops, cliffs and canyons, and occasionally in anthropogenic analogs such as in tunnels and tall buildings. Roosts have at least 9 feet of vertical clearance below, to allow for access and egress as this species is unable to land and take flight from flat ground. This attribute also limits their ability to hydrate as they are unable to drink from open water with less than 100 feet of relatively unobstructed access. Their diet consists primarily of moths and other flying insects, but they are also known to consume some flightless insects as well and primarily forage along riparian corridors. Threats include destruction of, or disturbance to, roosting and riparian foraging habitat due to urbanization and associated development, and recreation (e.g., rock-climbing, spelunking, etc.). Regional drought and reduced availability of suitable hydration sites is also thought to be a threat to this species. Reductions in prey species abundance due to widespread applications of insecticides and other pesticides and the spread of the fungal infection, “white-nose syndrome,” threaten this and other bat species as well.	Nearest documented occurrence records are from the adjacent Redwood Valley 7.5-min. USGS quad, ~2 miles to the south of the Planning Area; and the Lake Pillsbury 7.5-min. USGS quad, ~15 miles to the east of the Planning Area. The next nearest are from along the Sacramento River system and in the adjacent Sierra Nevada foothills > 70 miles to the east of the Planning Area (CNDDB 2023). Potentially suitable roosting habitat may occur within the Planning Area where exposed rock outcrops occur, though these are believed to be limited or lacking altogether within the incorporated City limits and proposed expanded SOI. However, larger, taller anthropogenic structures (e.g., buildings, infrastructure associated with the U.S. 101 Willits Bypass, etc.) within the incorporated City limits, proposed expanded SOI, and elsewhere in the Planning Area cannot be ruled out as potentially suitable roosting habitat. Suitable foraging habitat (as described) also exists within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area as do some sporadic water features which could represent adequate hydration sites.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Lasionycteris noctivagans (Silver-haired Bat)	NA	NA	NA	G3G4	S3S4	Primarily a forest bat, they are typically found in northern temperate coniferous and mixed-conifer/hardwood forests. The majority of their diet consists of moths, though other insects are also consumed, which they hunt along riparian corridors and forest edges, above the forest canopy, and over grasslands and wetlands. They are known to travel considerable distances between roosting sites and foraging areas. They breed in early spring and birth in mid-summer and females form small (≤ 70 individuals) maternal nursery colonies and roost in tree cavities or under loose bark on large snags (though other roost types are known), typically > 50 feet above the ground. They utilize numerous alternate roost sites throughout the season within a given area and, therefore, likely require forest stands with clusters of multiple large trees and/or snags. Considerable seasonal latitudinal migratory movements have been documented and hibernacula most commonly occur in tree cavities, under bark, and in rock crevices. A few other instances under wood piles, in leaf litter, buildings, mines, and caves have also been reported. Threats are primarily related to loss of roosting, foraging, and migratory habitat due to timber harvest activities that do not provide for sufficient retention of clusters of larger diameter trees and snags, as well as removal/degradation of riparian corridor habitats associated with urbanization and related development. Reductions in prey species abundance due to widespread applications of insecticides and other pesticides, and further spread of the fungal infection, “white-nose syndrome,” also threaten many bat species.	Nearest documented occurrence records are from the adjacent Burbeck 7.5- min. USGS quad, as well as others in the vicinity (e.g., Noyo Hill, Bailey Ridge, Dutchman’s Knoll, etc.) (CNDDB 2023). Potentially suitable hibernacula, roosting, and foraging habitat (as described) does exist within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Lasiurus frantzii (Western Red Bat)	NA	NA	SSC	G4	S3	A solitary and highly migratory species that ranges from as far north as British Columbia (Canada) during the summer, to as far south as South America during the boreal winter. They typically roost and hibernate in dense tree foliage (and occasionally caves). At least in North American territories, they appear to be associated with intact riparian habitats that have well represented willow (*Salix* spp.) and/or cottonwood (*Populus* spp.) components, where their diet consists of various flying insects. Mating occurs in late summer–early autumn and pregnant females birth in early spring. Threats include the loss of riparian roosting and foraging habitat due to agricultural habitat conversion as well as to urbanization and associated development. Reductions in prey species abundance due to widespread applications of insecticides and other pesticides also pose a threat to this species. Given that they will sometimes roost in leaf litter, fuels reduction projects and associated controlled burning of such material may also threaten Western Red Bat.	Nearest documented occurrence records are from the adjacent Burbeck and Redwood Valley 7.5-min. USGS quads, as well as others in the vicinity (e.g., Van Arsdale Reservoir, Lake Pillsbury, etc.) (CNDDB 2023). Potentially suitable roosting and foraging habitat (as described) does exist within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.
Martes caurina humboldtensis (Humboldt Marten)	FT	SE	SSC	G4G5T1	S1	Typically associated with more mesic, structurally-complex late-successional coniferous forests, though an isolated population from a young coastal Oregon forest was recently identified. Despite some diversity in arborescent density/structural complexity across occupied sites, a complex and cohesive shrub understory layer appears to be a consistent and important habitat attribute. Uses cavities in trees, snags, logs, and rocky areas for refugia and denning. Diet consists primarily of rodents, birds, and fruit. Threats include trapping, deforestation, and both timber harvest activities and high-intensity stand-replacement wildfire events that reduce forest stand structural complexity. Direct poisoning and poisoning of prey species with rodenticides and/or other pesticides likely also pose a threat to Humboldt Marten.	Nearest records are historic (pre-1980 and ca. 1950s) from the adjacent Brushy Mountain 7.5-min. USGS quad and elsewhere in Mendocino National Forest (CNDDB 2023; Zielinski et al. 2001; USFWS 2018). Current available scientific information indicates that Humboldt Marten has been extirpated from Mendocino, Sonoma, and most of Humboldt and Del Norte Counties despite the fact that the historical range of the subspecies extended ≤ 50 miles inland from the coast in California, south to approximately Fort Ross in Sonoma County (USFWS 2018). Of verifiable historical records for northern California with precise geographical information (n = 24), 83% were from coast redwood (*Sequoia sempervirens*) and Douglas-fir (*Pseudotsuga menziesii*) forests < 15 miles from the coast and no records were from > 22 miles from the coast (USFWS 2018). Potentially suitable habitat does exist within the Planning Area, primarily in densely forested portions of the proposed expanded SOI and elsewhere outside the incorporated City limits.

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Taxa	Conservation Status Listing and Rank					Description	Pertinent Distribution
	FESA*	CESA†	CDFW‡	GRank§	SRank§		
Pekania pennanti (Fisher) (Northern CA/Southern OR DPS)	NA	NA	SSC	G5	S2S3	Typically found in structurally-complex mature and late-seral coniferous forests and/or deciduous-riparian areas with high canopy closure and abundant coarse woody debris. Uses cavities in trees, snags, logs, and rocky areas for refugia and denning. Distribution is thought to be limited from areas subject to more frequent deep snowfall events. General predators that consume mice, squirrels, chipmunks, rabbits, hares, and porcupines, but also known to eat birds, insects, nuts, fruits, and fungi. Fisher populations crashed after the arrival of Eurasian human populations. Threats include hunting and trapping, and both timber harvest activities and high-intensity stand-replacement wildfire events that reduce forest stand structural complexity and remove large diameter trees and coarse woody debris. Direct poisoning and poisoning of prey species with rodenticides and/or other pesticides—particularly as a result of illegal *Cannabis* cultivation in remote areas and throughout the wildland urban interface—has also become an emergent threat to Fishers.	Nearest documented occurrence records include three (3) from within the Willits 7.5-min. USGS quad, just outside (< 1 mile) the Planning Area (CNDDB 2023). Other records also occur within the vicinity (CNDDB 2023). Suitable habitat does exist within the Planning Area, primarily in densely forested portions of the proposed expanded SOI and elsewhere outside the incorporated City limits.
Taxidea taxus (American Badger)	NA	NA	SSC	G5	S3	Mostly nocturnal, badgers inhabit dry open grasslands, fields, pastures, orchards, and other agricultural areas. Dens are in underground in burrows they excavate and line with grasses and other vegetation. Burrows can be extensive, with multiple tunnels and chambers up to ~10 feet underground. Spend winters in a state of torpor. Badgers are carnivorous and their diet consists of mainly fossorial or terrestrial animals such as rodents, as well as skunks, birds, reptiles, amphibians, insects, fish, and carrion. Threats include vehicle collisions where roads without wildlife passages transect territories, development, habitat conversion, and intentional trapping, hunting, and poisoning.	Nearest documented occurrence records are from the adjacent Redwood Valley, Longvale, and Brushy Mountain 7.5- min. USGS quads; ~1, ~3, and ~5 miles from the Planning Area, respectively (CNDDB 2023). Potentially suitable habitat (as described) does exist within the incorporated City limits, proposed expanded SOI, and elsewhere throughout the Planning Area.

Conservation Status, Listing, and Rarity Rank Designations

***Federal Endangered Species Act (FESA)**

FE: Federal Endangered
FT: Federal Threatened
FPE: Federal Proposed Endangered
FPT: Federal Proposed Threatened
FC: Federal Candidate
FDR: Federal Delisted (Recovered)
FDE: Federal Delisted (Extinct)

†California Endangered Species Act (CESA)

SE: State Endangered
ST: State Threatened
SCE: State Candidate Endangered
SCT: State Candidate Threatened
SR: State Rare
SDR: State Delisted (Recovered)
SDE: State Delisted (Extinct)
SNR: State Not Reviewed

‡California Department of Fish & Wildlife's (CDFW) Other Status Designations

FP: Fully Protected species
SSC: Species of Special Concern
WL: Watch List

§Global (G) / State (S) / Infraspecific Trinomial Taxon (T) Rarity Ranks (NatureServe Conservation Status Ranks)

G/S/T—X: Presumed extinct or eliminated; not located despite extensive, focused search efforts
G/S/T—H: Possibly extinct or eliminated; known only from historic records, but with the potential for rediscovery
G/S/T—1: Critically imperiled, due to extreme rarity (often 5 or fewer occurrences) and because of factors making it especially vulnerable to extirpation
G/S/T—2: Imperiled, due to rarity, very restricted range, very few occurrences (20 or fewer), steep declines
G/S/T—3: Vulnerable, due to restricted range, populations 80 and fewer, recent declines
G/S/T—4: Apparently secure, but with cause for long-term concern due to declines or other factors
G/S/T—5: Secure, due to common or widespread abundance
Q: Questionable taxonomy that may reduce conservation priority
?: Inexact numeric rank

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* Federal Endangered Species Act (1973 as amended)
† California Endangered Species Act (1970 as amended)
‡ Other California Department of Fish and Wildlife (CDFW) Special Status Designations (CDFW 2023b)
§ NatureServe ("Heritage Method") Conservation Status Ranks (NatureServe 2023)

APPENDIX MCGPP.

Selected Mendocino County General Plan Resource Management Element (revised in 2020, adopted in 2021) policies and action items potentially applicable to biological resources within the City of Willits' proposed expanded Sphere of Influence. The complete Mendocino County General Plan Resource Management Element can be accessed at the following URL: https://www.mendocinocounty.org/home/showpublisheddocument/54487/638055061981600000

WATER RESOURCES

WATERSHED POLICIES

Policy RM-1: Protect stream corridors and associated riparian habitat.

Action Item RM-1.1: Require adequate buffers for all projects potentially impacting stream corridors and/or their associated riparian habitat.

Commented [JM1]: This is an implementation program that has not been adopted

Policy RM-2: Promote and participate in watershed restoration and enhancement projects.

Policy RM-3: Work cooperatively with property owners, agencies, and organizations to develop and support programs that maintain the integrity of stream systems for flood control, aquatic habitat, and water supply.

Policy RM-4: Promote and support public outreach and education programs pertaining to watershed and water resources stewardship.

Action Item RM-4.1: Develop a Riparian Systems Management Plan to facilitate coordination and cooperation between organizations and individuals responsible for the diverse functions – flood control, stormwater management, groundwater stewardship, aquatic habitat protection/enhancement – occurring in watersheds throughout the county.

Policy RM-5: Promote and encourage land-use activities that maintain or improve channel elevation and banks for rivers and streams in the county.

WATER RESOURCES POLICIES

Policy RM-9: The development and implementation of new water-conserving technologies should be encouraged as a means of reducing water demands.

Policy RM-11: Work with local, state, and federal agencies and organizations to develop and protect water supplies in a manner that is consistent with adopted General Plan policies, recognizing sustainable yields and protections for the environment. The County will:

- Protect existing groundwater recharge areas from sediment, chemical inputs, and other negative effects of development.
- Work with the State Department of Water Resources to finalize the State's "Instream Flow Policy."

Policy RM-12: The County supports the creation of a comprehensive plan for surface and groundwater resources in Mendocino County. The comprehensive plan should include the following components:

- Prioritizing watersheds for detailed analysis, based on unmet needs.
- Groundwater assessments.
- Assessing existing surface water resources, including water quality and instream flows.

Policy RM-16: The County will cooperate with other agencies, including the State of California Department of Water Resources, to halt illegal diversions of water from streams and rivers.

Policy RM-17: No development shall be allowed by the County beyond proof of the capability of the available water supply.

WATER QUALITY POLICIES

Policy RM-19: Promote the incorporation of project design features that will improve water quality by minimizing impervious surface areas, maximizing on-site retention of stormwater runoff, and preserving existing vegetation to the extent possible. Examples include:

- Using Low Impact Development (LID) techniques.
- Updating the County's Building Codes to address "green" building and LID techniques that can reduce pollution of runoff water and promoting these techniques.

Policy RM-20: Require integration of stormwater best management practices, potentially including those that mimic natural hydrology, into all aspects of development and community design, including streets and parking lots, homes and buildings, parks, and public landscaping.

Policy RM-21: Promote and support agricultural best management practices that protect or enhance surface and groundwater quality.

Policy RM-22: Support public and private programs to reduce water contamination and improve the water quality in county rivers and streams, specifically those that do not meet federal water quality standards.

Policy RM-23: The County shall work with other responsible regulatory agencies to prevent the discharge or threatened discharge of sediment from any activity in amounts harmful to beneficial uses of the water.

BIOLOGY AND ECOLOGY RESOURCES

ECOSYSTEMS POLICIES

Policy RM-24: Protect the county's natural landscapes by restricting conversion and fragmentation of timberlands, oak woodlands, stream corridors, farmlands, and other natural environments.

Policy RM-25: Prevent fragmentation and loss of our oak woodlands, forests, and wildlands and preserve the economic and ecological values and benefits.

Policy RM-26: Protect, use, and manage the county's farmlands, forests, water, air, soils, energy, and other natural resources in an environmentally sound and sustainable manner.

Policy RM-27: Conserve, restore and enhance natural resources, sensitive environments, and ecological integrity.

Action Item RM-27.1: Identify and maintain wildlife movement corridors to support biodiversity and healthy natural processes.

Policy RM-28: All discretionary public and private projects that identify special-status species in a biological resources evaluation (where natural conditions of the site suggest the potential presence of special-status species) shall avoid impacts to special-status species and their habitat, to the maximum extent feasible. Where impacts cannot be avoided, projects shall include the implementation of site-specific or project-specific effective mitigation strategies developed by a qualified professional in consultation with state or federal resource agencies with jurisdiction (if applicable) including, but not limited to, the following strategies:

- Preservation of habitat and connectivity of adequate size, quality, and configuration to support the special-status species. Connectivity shall be determined based on the specifics of the species' needs.
- Provision of supplemental planting and maintenance of grasses, shrubs, and trees of similar quality and quantity to provide adequate vegetation cover to enhance water quality, minimize sedimentation and soil transport, and provide adequate shelter and food for wildlife.
- Provide protection for habitat and the known locations of special-status species through adequate buffering or other means.
- Provide replacement habitat of like quantity and quality on- or off-site for special-status species.
- Enhance existing special-status species habitat values through restoration and replanting of native plant species.
- Provision of temporary or permanent buffers of adequate size (based on the specifics of the special-status species) to avoid nest abandonment by nesting migratory birds and raptors associated with construction and site development activities.
- Incorporation of the provisions or demonstration of compliance with applicable recovery plans for federally listed species.

Action Item RM-28.1: The County shall develop CEQA standards that require disclosure of impacts to all sensitive biotic communities during a review of discretionary projects. These standards shall require the following mitigation:

- Sensitive Biotic Communities – For all sensitive biotic communities, restore or create habitat at a no net loss standard of habitat value lost. Where it is determined that restoration or creation are ecologically infeasible, preserve at a 2:1 ratio for habitat loss.
- Oak Woodland – Maintain and improve oak woodland habitat to provide for slope stabilization, soil protection, species diversity, and wildlife habitat through the following measures:
- To the maximum extent possible, preserve oak trees and other vegetation that occur near the heads of drainages or depressions to maintain the diversity of vegetation type and wildlife habitat as part of agricultural projects.
- Comply with the Oak Woodlands Preservation Act (PRC Section 21083.4) to conserve the integrity and diversity of oak woodlands, and retain, to the maximum extent feasible, existing oak woodland and chaparral communities and other significant vegetation as part of residential, commercial, and industrial approvals.
- Provide appropriate replacement of lost oak woodlands or preservation at a 2:1 ratio for habitat loss.

Policy RM-29: All public and private discretionary projects shall avoid impacts to wetlands if feasible. If avoidance is not feasible, projects shall achieve no net loss of wetlands, consistent with state and federal regulations.

Policy RM-30: Individual development projects and conversions from rangeland to intensive agriculture should retain movement corridor(s) adequate (both in size and in habitat quality) to allow for continued wildlife use based on the species anticipated to use the corridor and maintain compatibility with adjacent uses.

Policy RM-31: For the purposes of implementing this General Plan, the County defines “special status species” and “sensitive biotic communities” to include all species and habitat identified as such by the California Department of Fish and Game, U.S. Fish and Wildlife Service, or NOAA Fisheries.

Policy RM-32: Use conservation and open space easements, growth boundaries, tax incentives, and other tools to:

- Protect, restore, and enhance significant resource values.
- Reduce premature conversion of resource lands in and around community areas.
- Provide linkages between natural resource areas.

Policy RM-33: Reduce development of open space and agricultural land by encouraging multistory buildings.

Policy RM-34: Protect and enhance watershed ecosystems by supporting and integrating local, state, and federal requirements avoiding regulatory duplication.

Action Item RM-34.1: Advocate education, technical and financial assistance, collaboration, and best management practices to protect, enhance, and manage the county’s watershed, earth, and biological resources.

Soil Resources

Soil Resources Policies

Policy RM-64: Development shall be located, designed, constructed, and managed as follows to protect soil resources and minimize soil loss and erosion:

- Slopes over 15 percent: Limit land uses, densities, intensities and disturbances, vegetation removal, and hydrologic modifications on slopes exceeding 15 percent.
- Slopes 20 percent or more: In addition to standards for slopes over 15%, establish slope stability requirements for areas with, or directly adjacent to, slopes of 20 percent or greater within geologic units susceptible to slope failure and areas of mapped landslides.
- Slopes 30 percent or more: In addition to standards for slopes over 20%, discourage road and building site construction in areas that exceed 30 percent slopes or cross slopes.

Action Item RM-64.1: Before development, require evaluation of slope stability in areas with the potential for landslides, including structural foundation engineering and potential impacts to adjacent lands. The Building Official may waive this evaluation for existing single-family lots.

Policy RM-65: Discourage development and conversion from rangeland to intensive agriculture in areas of known landslides or slopes where weak geologic materials are susceptible to failure.

Policy RM-66: Promote clustering and density transfers where appropriate to reduce soil loss and impacts on watersheds and fisheries.

Policy RM-67: Continue identifying and reducing soil erosion and sedimentation associated with lands, facilities, and operations owned or operated by the County.

Mineral Resources Policies

Policy RM-68: Environmental protection is a high priority during mineral extraction and associated processing operations and site reclamation. Recovery of mineral resources is not allowed when the County finds that adverse environmental impacts outweigh the public benefit.

Action Item RM-68.1: Identify and protect resources/areas that may provide mineral extraction opportunities, including rock quarries and gravel.

Action Item RM-68.2: Continue to administer the California Surface Mining and Reclamation Act (SMARA).

Action Item RM-68.3: Evaluate the effectiveness of Surface Mining and Reclamation regulations and project conditions in achieving County goals.

Action Item RM-68.4: Promote off-stream terrace mining or hard rock quarrying operations over instream operations.

Policy RM-70: Surface mining sites, especially those in areas with cultural, scenic, or recreational values, shall be restored to harmonize with the natural environment when the mine's reclamation plan is implemented.

Biological Resources Policies

Policy RM-74: Promote land uses and management practices that protect biological diversity and productivity.

Policy RM-75: New development shall protect sensitive environments and resource corridors while maintaining compatibility with adjacent uses.

Policy RM-76: The design of new development should emphasize avoiding sensitive resources and environments rather than their removal and replacement.

Policy RM-77: Discretionary development shall be designed or conditioned to achieve no net loss of sensitive resources.

Policy RM-78: Protection of existing sensitive resources is the highest priority. Onsite replacement or offsite replacement, protection, or enhancement is less desirable.

Policy RM-79: Limit land use density and intensity within and adjacent to critical wildlife habitats, such as wetlands, deer wintering range, old-growth forests*, and riparian corridors.

Policy RM-80: Maintain resource diversity and integrity by protecting and enhancing continuous resource corridors compatible with adjacent uses through project design.

Policy RM-81: Conserve native vegetation, critical habitats, and soil resources through education, technical and financial assistance, cooperative endeavors, best management practices, and soils and vegetation management plans for development and resource uses.

Policy RM-82: Encourage farmers, landowners, and property managers to protect sensitive environments, and minimize the effects of recreation, tourism, agriculture, and development on these resources. Promote techniques and features such as:

- Habitat contiguity,
- Wildlife corridors,
- Maintaining compatibility with adjacent uses,
- Maintaining habitat for sensitive plant and animal species.

Action Item RM-82.1: Work with agencies and organizations to educate the public about effective ways to protect listed plant and animal species and preserve sensitive habitats.

Action Item RM-82.2: Seek private and public funding for fish habitat restoration programs such as the County Fish and Game Advisory Committee, community salmon and steelhead rearing, and other efforts.

Action Item RM-82.3: Promote conservation easements to protect wildlife habitat, wetlands, and other sensitive environments.

Action Item RM-82.4: Provide information to landowners, developers, and the public on the importance and value of maintaining wildlife corridors.

Policy RM-83: Vegetation removal should be reviewed when involving five (5) or more acres, assessing the following impacts:

- Grading and landform modifications including effects on site stability, soil erosion and hydrology.
- Effects on the natural vegetative cover and ecology in the project area.
- Degradation to sensitive resources, habitat and fisheries resources.
- Compatibility with surrounding uses.
- Visual impacts from public vantage points.
- Cumulative and growth-inducing impacts.

For the purposes of implementing this policy, “vegetation removal” does not include state-regulated timber harvest.

Action Item RM-83.1: Consider adopting an ordinance for the regulation of vegetation removal.

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* Generally, “old growth forests” are those which have not been logged.

Policy RM-84: Vegetation management and landscaping for public and private development should emphasize the protection and continuity of natural habitats and hydrology.

Policy RM-85: Promote the conservation and use of native species or drought-tolerant, fire-resistive, and non-invasive vegetation.

Policy RM-86: In rural areas, promote vegetation and landscape management programs that protect wildlife and livestock habitat, discourage pest species and non-native species, reduce wildfire risk, and conserve water resources.

Policy RM-88: Conserve and replant oak woodlands and stands of native oaks in community areas and developments. Protect oak woodlands in other areas through limitations on density and clustering.

Policy RM-89: Maintain and enhance the urban tree canopy, which creates a sense of open space.

Action Item RM-89.1: Review construction and landscaping site plans to ensure that healthy trees in community areas are not removed unnecessarily.

Policy RM-90: Conserve the county's hillside vegetation (consistent with fire safety standards) by incorporating density transfers, clustering, small building sites, shared improvements, and other measures that:

- Are compatible with the natural terrain and hydrology.
- Conserve continuous critical habitats, oak woodlands, and natural vegetation.
- Minimize visual impacts.

Policy RM-91: Protect wildlife and livestock from depredation by domestic animals.

Action Item RM-91.1: Enforce County laws regulating wildlife and livestock depredation by dogs or other domestic animals.

Policy RM-92: Conserve and enhance watercourses to protect habitat, fisheries, soils, and water quality.

Policy RM-93: Conserve and enhance streamside (riparian) vegetation through development design and standards.

Policy RM-94: Stream restoration and maintenance programs shall conserve riparian vegetation and the floodwater carrying capacity of river and stream channels.

Policy RM-95: Whenever possible, use riparian vegetation in conjunction with natural or appropriate structural materials to achieve a natural appearance.

FISHERIES POLICIES

Policy RM-96: Encourage public agencies and private property owners to protect fishery habitat and participate in fishery enhancement projects (including removal of barriers to fish passage) for coastal and inland waterways of Mendocino County.

Action Item RM-96.1: Continue participation in the 5-County Salmonid Conservation Program and work with organizations and agencies at all levels to formulate strategies and implement actions to improve watershed conditions and fisheries habitat.

Policy RM-97: Support instream flows adequate to maintain and protect fisheries and beneficial uses.

Policy RM-98: Support implementation of fisheries and watershed management plans adopted by public agencies, such as the Summer Steelhead Management Plan for the Middle Fork Eel River and Mendocino County Salmon and Steelhead Management Plan.

Policy RM-99: Support the restoration of spawning and nursery habitat in all salmonid-bearing streams and rivers.

Policy RM-101: Water development projects shall apply for all required permits and shall include mitigation and enhancement features for fish and wildlife if required to address adverse environmental impacts.

Action Item RM-101.1: Support State and Federal measures to protect and enhance the freshwater and marine ecology through the development process, such as:

- Stream corridor protection and restoration.
- Riparian vegetation protection and restoration.
- Erosion and sediment control measures.
- Surface mining controls.

Action Item RM-101.2: Update all County application forms as needed to indicate the source of water for all water development projects.

Policy RM-102: Protection of the county's fisheries shall take priority over the short-term benefits of oil extraction.

Natural and Rural Landscapes Resources

Forest Resources Policies

Policy RM-120: Promote sustainable forest management practices (e.g., carbon sequestration, reforestation, timber stand improvement, stream corridor, and water quality protection).

Policy RM-122: Support agency monitoring of water quality, species of special concern, habitat connectivity, wetlands, and riparian areas as barometers of forest health and productivity.

Open Spaces, Rural Landscapes, and Scenic Resources Policies

Policy RM-129: New development should incorporate open space and resource conservation measures, coordinated with the surrounding area.

Policy RM-130: Support land trusts and similar organizations in identifying and protecting lands and corridors with significant resource, recreational or scenic values.

Action Item RM-130.1: Continue to protect the scenic qualities of uplands and rural landscapes through measures such as Timberland Production and large lot zoning controls, clustering, the Williamson Act, the Forest Practices Act, and good management of public lands.

Policy RM-134: Lakes, stream corridors, large reservoirs, and other water bodies have scenic values that shall be maintained or enhanced and restored when necessary.

DARK SKY POLICIES

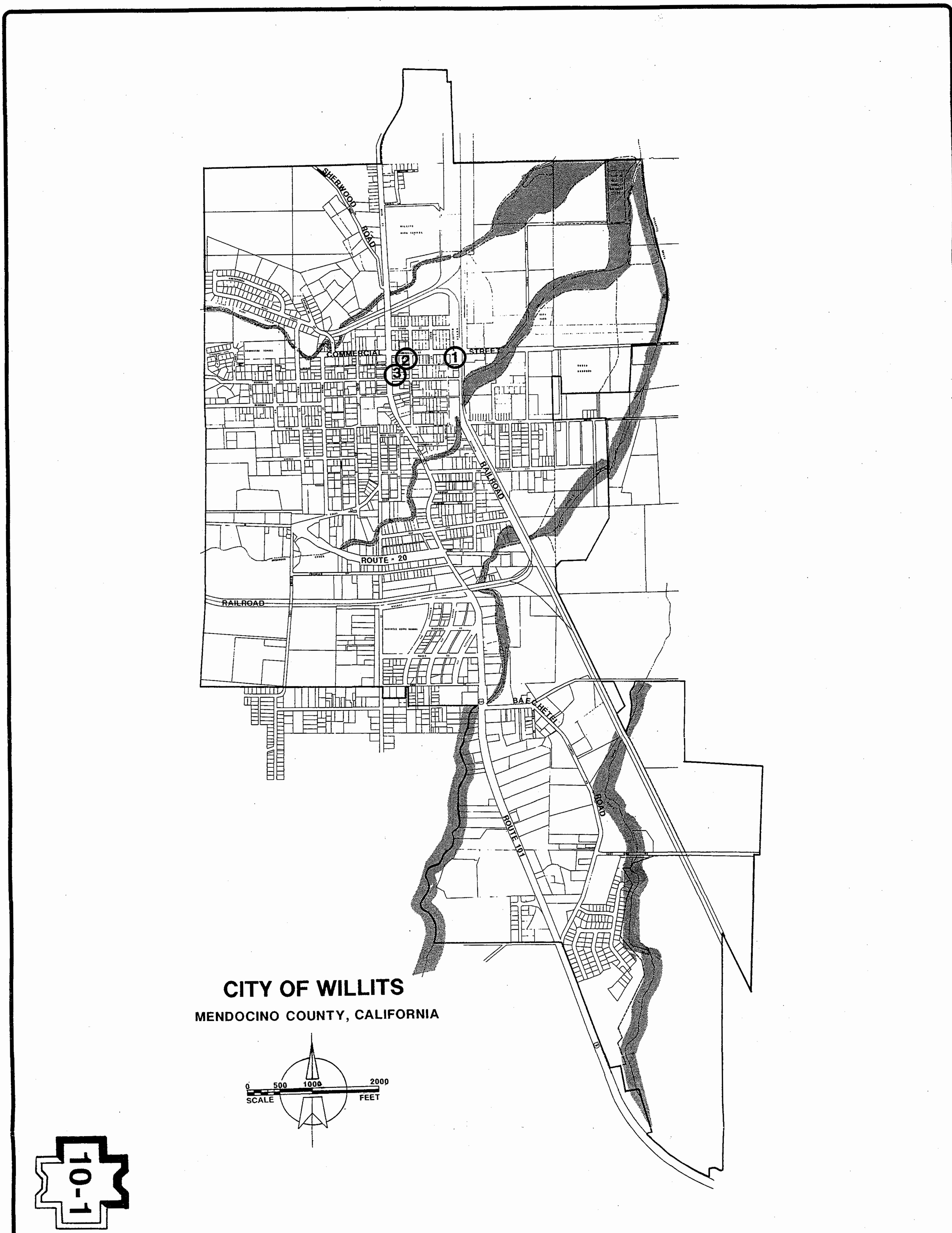
Policy RM-137: The County shall seek to protect the qualities of the nighttime sky and reduce energy use by requiring that outdoor nighttime lighting is directed downward, kept within property boundaries, and reduced both in intensity and direction to the level necessary for safety and convenience.

Action Item RM-137.1: Amend the County's Codes to incorporate standards for outdoor nighttime lighting that implement Policy RM-137.

Action Item RM-137.2: Encourage the use of motion sensors for indoor and outdoor lighting to reduce energy use.

Policy RM-138: All County streetlights shall be of a “full cutoff” design to limit the upward spread of lighting.

Appendix C - Cultural and Tribal Cultural Resources



LEGEND

1. SKUNK TRAIN DEPOT
2. WILLITS CARNEGIE LIBRARY (85 EAST COMMERCIAL STREET)
3. IRVINE & MUIR COMPANY (212 SOUTH MAIN STREET)

AREAS OF POTENTIAL ARCHAEOLOGICAL SIGNIFICANCE

WILLITS GENERAL PLAN

HISTORICAL AND ARCHAEOLOGICAL RESOURCES

MARTIN · CARPENTER · ASSOCIATES
CITY AND REGIONAL PLANNERS

NATIVE AMERICAN HERITAGE COMMISSION

NAHC HEADQUARTERS
1550 Harbor Boulevard
Suite 100
West Sacramento, California 95691
(916) 373-3710
nahc@nahc.ca.gov
NAHC.ca.gov

February 28, 2023

Dusty Duley
City of Wililts

Via Email to: dduley@cityofwillits.org

Re: Native American Consultation, Pursuant to Senate Bill 18 (SB18), Government Codes §65352.3 and §65352.4, as well as Assembly Bill 52 (AB52), Public Resources Codes §21080.1, §21080.3.1 and §21080.3.2, City of Willits Land Use Element-Sphere Of Influence Update,Project, Mendocino County

Dear Mr. Duley:

Attached is a consultation list of tribes with traditional lands or cultural places located within the boundaries of the above referenced counties or projects.

Government Codes §65352.3 and §65352.4 require local governments to consult with California Native American tribes identified by the Native American Heritage Commission (NAHC) for the purpose of avoiding, protecting, and/or mitigating impacts to cultural places when creating or amending General Plans, Specific Plans and Community Plans.

Public Resources Codes §21080.3.1 and §21080.3.2 requires public agencies to consult with California Native American tribes identified by the Native American Heritage Commission (NAHC) for the purpose of avoiding, protecting, and/or mitigating impacts to tribal cultural resources as defined, for California Environmental Quality Act (CEQA) projects.

The law does not preclude local governments and agencies from initiating consultation with the tribes that are culturally and traditionally affiliated within your jurisdiction. The NAHC believes that this is the best practice to ensure that tribes are consulted commensurate with the intent of the law.

Best practice for the AB52 process and in accordance with Public Resources Code §21080.3.1(d), is to do the following:

Within 14 days of determining that an application for a project is complete or a decision by a public agency to undertake a project, the lead agency shall provide formal notification to the designated contact of, or a tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, which shall be accomplished by means of at least one written notification that includes a brief description of the proposed project and its location, the lead agency contact information, and a notification that the California Native American tribe has 30 days to request consultation pursuant to this section.

The NAHC also recommends, but does not require that lead agencies include in their notification letters, information regarding any cultural resources assessment that has been completed on the area of potential affect (APE), such as:

1. The results of any record search that may have been conducted at an Information Center of the California Historical Resources Information System (CHRIS), including, but not limited to:

    - A listing of any and all known cultural resources have already been recorded on or adjacent to the APE, such as known archaeological sites;
    - Copies of any and all cultural resource records and study reports that may have been provided by the Information Center as part of the records search response;
    - Whether the records search indicates a low, moderate or high probability that unrecorded cultural resources are located in the APE; and
    - If a survey is recommended by the Information Center to determine whether previously unrecorded cultural resources are present.

2. The results of any archaeological inventory survey that was conducted, including:

    - Any report that may contain site forms, site significance, and suggested mitigation measures.

    All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum, and not be made available for public disclosure in accordance with Government Code Section 6254.10.

3. The result of the Sacred Lands File (SFL) check conducted through the Native American Heritage Commission. The request form can be found at http://nahc.ca.gov/wp-content/uploads/2015/08/Local-Government-Tribal-Consultation-List-Request-Form-Update.pdf.

4. Any ethnographic studies conducted for any area including all or part of the potential APE; and

5. Any geotechnical reports regarding all or part of the potential APE.

Lead agencies should be aware that records maintained by the NAHC and CHRIS is not exhaustive, and a negative response to these searches does not preclude the existence of a tribal cultural resource. A tribe may be the only source of information regarding the existence of a tribal cultural resource.

This information will aid tribes in determining whether to request formal consultation. In the event, that they do, having the information beforehand well help to facilitate the consultation process.

If you receive notification of change of addresses and phone numbers from tribes, please notify the NAHC. With your assistance we can assure that our consultation list remains current.

If you have any questions, please contact me at my email address: Cameron.vela@nahc.ca.gov.

Sincerely,

Cameron Vela

Cameron Vela
Cultural Resources Analyst

Attachment

Native American Heritage Commission
Tribal Consultation List
Mendocino County
2/28/2023

Coyote Valley Band of Pomo Indians
Michael Hunter, Chairperson
P.O. Box 39/ 7901 Hwy 10, North — Pomo
Redwood Valley, CA, 95470
Phone: (707) 485 - 8723
Fax: (707) 485-1247

Guidiville Indian Rancheria
Donald Duncan, Chairperson
P.O. Box 339 — Pomo
Talmage, CA, 95481
Phone: (707) 462 - 3682
Fax: (707) 462-9183
admin@guidiville.net

Hopland Band of Pomo Indians
Sonny Elliott, Chairperson
3000 Shanel Road — Pomo
Hopland, CA, 95449
Phone: (707) 472 - 2100
Fax: (707) 744-1506
sjelliott@hoplandtribe.com

Cahto Tribe
Mary Norris, Chairperson
P.O. Box 1239 — Cahto
Laytonville, CA, 95454 — Pomo
Phone: (707) 984 - 6197
Fax: (707) 984-6201
mjnorris@cahtotribe-nsn.gov

Manchester Band of Pomo Indians of the Manchester Rancheria
Jaime Cobarrubia, Chairperson
P.O. Box 623 — Pomo
Point Arena, CA, 95468
Phone: (707) 882 - 2788
Fax: (707) 882-3417

Noyo River Indian Community
P. O. Box 91 — Pomo
Fort Bragg, CA, 95437 — Yuki

Pinoleville Pomo Nation
Leona Willams, Chairperson
500 B Pinoleville Drive — Pomo
Ukiah, CA, 95482
Phone: (707) 463 - 1454
Fax: (707) 463-6601

Potter Valley Tribe
Salvador Rosales, Chairperson
2251 South State Street — Pomo
Ukiah, CA, 95482
Phone: (707) 462 - 1213
Fax: (707) 462-1240
pottervalleytribe@pottervalleytribe.com

Redwood Valley or Little River Band of Pomo Indians
Debra Ramirez, Chairperson
3250 Road I — Pomo
Redwood Valley, CA, 95470
Phone: (707) 485 - 0361
Fax: (707) 485-5726
rvrsecretary@comcast.net

Robinson Rancheria of Pomo Indians
Beniakem Cromwell, Chairperson
P.O. Box 4015 — Pomo
Nice, CA, 95464
Phone: (707) 275 - 0527
Fax: (707) 275-0235
bcromwell@rrcbc-nsn.gov

Round Valley Reservation/ Covelo Indian Community
James Russ, President
77826 Covelo Road — ConCow
Covelo, CA, 95428 — Nomlaki
Phone: (707) 983 - 6126 — Pit River
Fax: (707) 983-6128 — Pomo
tribalcouncil@rvit.org — Wailaki
Wintun
Yuki

This list is current only as of the date of this document and is based on the information available to the Commission on the date it was produced. Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is applicable only for consultation with Native American tribes under Government Code Sections 65352.3, 65352.4 et seq. and Public Resources Code Sections 21080.3.1 for the proposed City of Willits Land Use Element-Sphere Of Influence Update,Project, Mendocino County.

Native American Heritage Commission
Tribal Consultation List
Mendocino County
2/28/2023

Sherwood Valley Rancheria of Pomo

Melanie Rafanan, Chairperson
190 Sherwood Hill Drive — Pomo
Willits, CA, 95490
Phone: (707) 459 - 9690
Fax: (707) 459-6936
svrthpo@sherwoodband.com

Yokayo Tribe

Yokayo Tribe, Chairperson
P.O. Box 362 — Pomo
Talmadge, CA, 95481

This list is current only as of the date of this document and is based on the information available to the Commission on the date it was produced. Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

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APPENDIX D - GEOLOGY AND SOILS APPENDIX

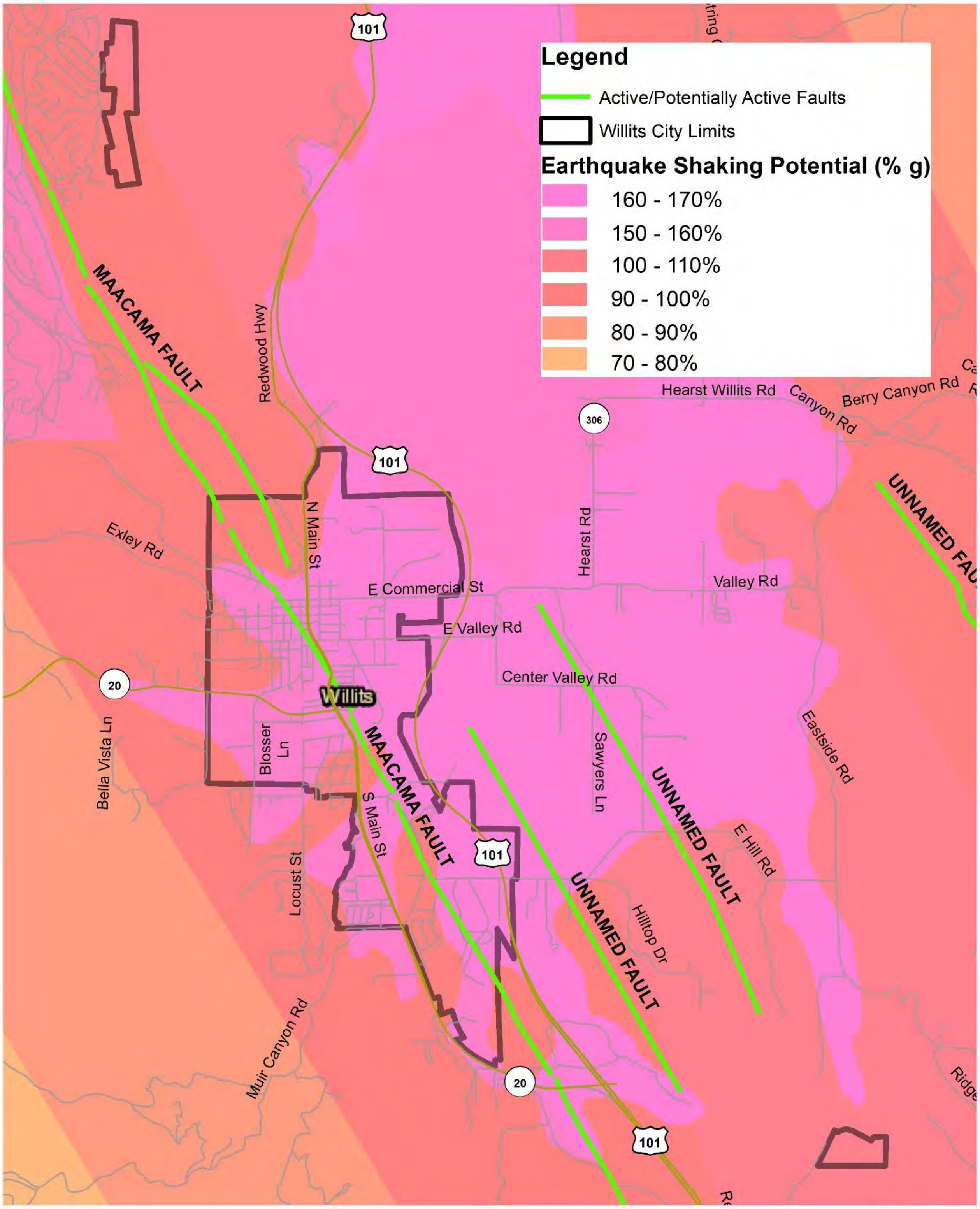


Figure S-1 Faulting and Seismicity

Sources: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, D. Branum, R. Chen, C. Wills (California Geological Survey); M. Petersen (United States Geological Survey).

United States Department of Agriculture

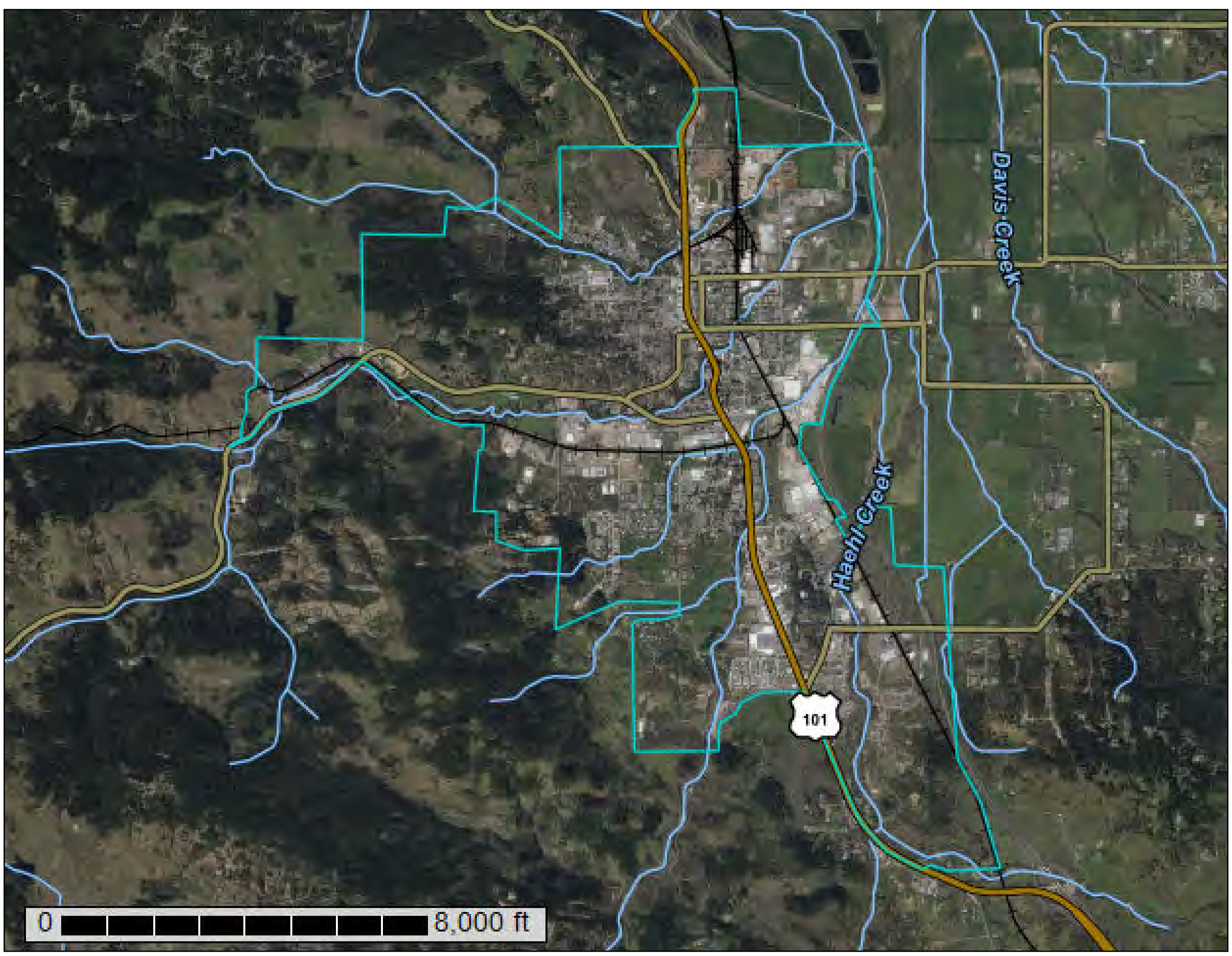
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Mendocino County, Eastern Part and Southwestern Part of Trinity County, California

Willits with Proposed SOI



September 22, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

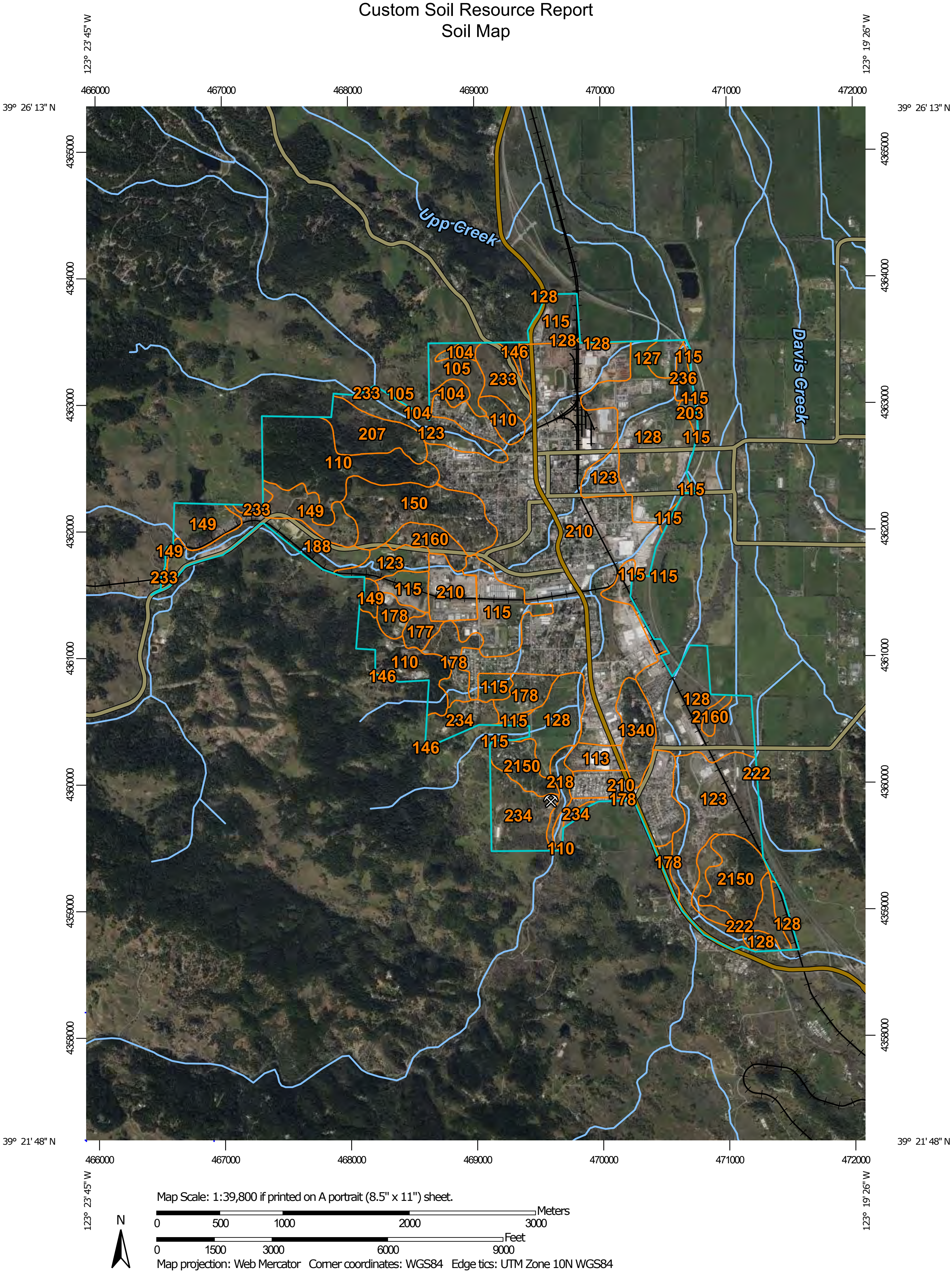
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mendocino County, Eastern Part and Southwestern Part of Trinity County, California
Survey Area Data: Version 18, Sep 7, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 7, 2022—May 31, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
104	Bearwallow-Hellman loams, 15 to 30 percent slopes	18.8	0.7%
105	Bearwallow-Hellman-Witherell complex, 30 to 50 percent slopes	31.1	1.1%
110	Casabonne-Wohly loams, 30 to 50 percent slopes	212.4	7.7%
113	Cole loam, drained, 0 to 2 percent slopes, MLRA 14	31.8	1.2%
115	Cole silty clay loam, 0 to 1 percent slopes, MLRA 14	164.2	6.0%
123	Feliz loam, 0 to 2 percent slopes	253.9	9.2%
127	Fluvaquents, 0 to 1 percent slopes	16.2	0.6%
128	Gielow sandy loam, 0 to 5 percent slopes	366.3	13.3%
146	Hopland-Sanhedrin-Kekawaka complex, 30 to 50 percent slopes	4.6	0.2%
149	Hopland-Witherell-Ashokawna complex, 30 to 50 percent slopes, MLRA 5	89.0	3.2%
150	Hopland-Wohly loams, 30 to 50 percent slopes	113.8	4.1%
177	Pinole gravelly loam, 0 to 2 percent slopes	14.6	0.5%
178	Pinole gravelly loam, 2 to 8 percent slopes	87.4	3.2%
188	Russian loam, 0 to 2 percent slopes	69.8	2.5%
203	Talmage gravelly sandy loam, 0 to 2 percent slopes	5.8	0.2%
207	Updegraff-Sanhedrin complex, 15 to 50 percent slopes	56.3	2.0%
210	Urban land	827.1	30.0%
218	Xerofluvents-Riverwash complex, 0 to 2 percent slopes	18.8	0.7%
222	Yokayo sandy loam, 8 to 15 percent slopes	41.0	1.5%
233	Yorkville-Ashokawna-Witherell complex, 30 to 50 percent slopes, MLRA 5	46.2	1.7%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
234	Yorkville-Yorktree-Ashokawna complex, 15 to 30 percent slopes, MLRA 5	97.8	3.5%
236	Water	11.5	0.4%
1340	Haploxeralfs-Argixerolls complex, 0 to 9 percent slopes, low ffd	43.6	1.6%
2150	Xerochrepts-Haploxeralfs-Argixerolls complex, 9 to 30 percent slopes, low ffd	96.3	3.5%
2160	Xerochrepts-Haploxeralfs-Argixerolls complex, 30 to 50 percent slopes, low ffd	35.6	1.3%
Totals for Area of Interest		**2,753.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Mendocino County, Eastern Part and Southwestern Part of Trinity County, California

104—Bearwallow-Hellman loams, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: hgpm
Elevation: 200 to 3,000 feet
Mean annual precipitation: 35 to 65 inches
Mean annual air temperature: 54 to 59 degrees F
Frost-free period: 150 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Bearwallow and similar soils: 40 percent
Hellman and similar soils: 30 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bearwallow

Setting

Landform: Mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 8 inches: loam
H2 - 8 to 35 inches: loam
H3 - 35 to 39 inches: weathered bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 35 to 39 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R015XD101CA - Loamy (Annual Grass)
Hydric soil rating: No

Description of Hellman

Setting

Landform: Mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 7 inches: loam
H2 - 7 to 14 inches: loam
H3 - 14 to 51 inches: gravelly clay loam
H4 - 51 to 72 inches: gravelly clay
H5 - 72 to 76 inches: weathered bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches; 72 to 76 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R015XD101CA - Loamy (Annual Grass)
Hydric soil rating: No

Minor Components

Cummiskey

Percent of map unit: 5 percent
Hydric soil rating: No

Hopland

Percent of map unit: 5 percent
Hydric soil rating: No

Maymen

Percent of map unit: 5 percent
Hydric soil rating: No

Witherell

Percent of map unit: 3 percent
Hydric soil rating: No

Yorkville

Percent of map unit: 3 percent
Hydric soil rating: No

Ashokawna

Percent of map unit: 3 percent
Hydric soil rating: No

Yorktree

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

105—Bearwallow-Hellman-Witherell complex, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hgpn
Elevation: 500 to 3,000 feet
Mean annual precipitation: 35 to 55 inches
Mean annual air temperature: 53 to 59 degrees F
Frost-free period: 150 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Bearwallow and similar soils: 35 percent
Hellman and similar soils: 25 percent
Witherell and similar soils: 15 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bearwallow

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Colluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 8 inches: loam
H2 - 8 to 35 inches: loam
H3 - 35 to 45 inches: bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 35 to 39 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R015XD101CA - Loamy (Annual Grass)
Hydric soil rating: No

Description of Hellman

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Colluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 7 inches: loam
H2 - 7 to 14 inches: loam
H3 - 14 to 51 inches: gravelly clay loam
H4 - 51 to 72 inches: gravelly clay
H5 - 72 to 79 inches: bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: More than 80 inches; 72 to 76 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R015XD101CA - Loamy (Annual Grass)
Hydric soil rating: No

Description of Witherell

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope

Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from sandstone and/or residuum weathered from sandstone

Typical profile

A - 0 to 7 inches: sandy loam
Bt - 7 to 12 inches: gravelly sandy loam
C - 12 to 79 inches: gravel

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R015XD103CA - Shallow Loamy (Annual Grass)
Hydric soil rating: No

Minor Components

Cummiskey

Percent of map unit: 4 percent
Hydric soil rating: No

Yorktree

Percent of map unit: 3 percent
Hydric soil rating: No

Yorkville

Percent of map unit: 3 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 3 percent
Hydric soil rating: No

Hopland

Percent of map unit: 3 percent
Hydric soil rating: No

Ashokawna

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

Maymen

Percent of map unit: 3 percent
Hydric soil rating: No

110—Casabonne-Wohly loams, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hgpt
Elevation: 500 to 4,000 feet
Mean annual precipitation: 35 to 80 inches
Mean annual air temperature: 54 to 59 degrees F
Frost-free period: 150 to 290 days
Farmland classification: Not prime farmland

Map Unit Composition

Casabonne and similar soils: 50 percent
Wohly and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Casabonne

Setting

Landform: Mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Colluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale

Typical profile

A1 - 0 to 7 inches: loam
A2 - 7 to 15 inches: loam
Bt1 - 15 to 24 inches: clay loam
Bt2 - 24 to 43 inches: clay loam
Bt3 - 43 to 53 inches: gravelly clay loam
CB - 53 to 58 inches: gravelly clay loam
Ct - 58 to 71 inches: gravel

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 58 to 62 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F015XY015CA - Loamy Mountains >40"ppt
Hydric soil rating: No

Description of Wohly

Setting
Landform: Mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Typical profile
A1 - 0 to 5 inches: loam
A2 - 5 to 11 inches: loam
Bt1 - 11 to 17 inches: gravelly clay loam
Bt2 - 17 to 24 inches: gravelly clay loam
Ct - 24 to 71 inches: paragravel

Properties and qualities
Slope: 30 to 50 percent
Depth to restrictive feature: 20 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F015XY015CA - Loamy Mountains >40"ppt
Hydric soil rating: No

Minor Components

Hellman
Percent of map unit: 4 percent

Hydric soil rating: No

Bearwallow
Percent of map unit: 4 percent
Hydric soil rating: No

Hopland
Percent of map unit: 3 percent
Hydric soil rating: No

Pardaloe
Percent of map unit: 3 percent
Hydric soil rating: No

Woodin
Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 3 percent
Hydric soil rating: No

113—Cole loam, drained, 0 to 2 percent slopes, MLRA 14

Map Unit Setting
National map unit symbol: 2xc91
Elevation: 500 to 1,950 feet
Mean annual precipitation: 38 to 73 inches
Mean annual air temperature: 56 to 59 degrees F
Frost-free period: 208 to 289 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Cole and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cole

Setting
Landform: Alluvial fans, flood-plain steps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Parent material: Alluvium derived from metamorphic and sedimentary rock

Typical profile
Ap - 0 to 5 inches: loam
A1 - 5 to 15 inches: loam
A2 - 15 to 20 inches: clay loam

Bt1 - 20 to 40 inches: clay loam
Bt2 - 40 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: NoneRare
Frequency of ponding: Rare
Maximum salinity: Nonsaline (0.2 to 0.5 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.8 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: R014XG907CA - Loamy Bottom
Hydric soil rating: No

Minor Components

Russian

Percent of map unit: 13 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

115—Cole silty clay loam, 0 to 1 percent slopes, MLRA 14

Map Unit Setting

National map unit symbol: 2xc90
Elevation: 120 to 1,730 feet
Mean annual precipitation: 37 to 58 inches
Mean annual air temperature: 55 to 60 degrees F
Frost-free period: 203 to 313 days
Farmland classification: Prime farmland if irrigated and drained

Map Unit Composition

Cole and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cole

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 8 inches: silty clay loam
Bt1 - 8 to 15 inches: silty clay loam
Bt2 - 15 to 27 inches: clay loam
Bt3 - 27 to 41 inches: loam
C - 41 to 60 inches: loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 12 to 48 inches
Frequency of flooding: NoneRare
Frequency of ponding: Occasional
Maximum salinity: Nonsaline (0.2 to 0.5 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Ecological site: R014XD100CA - Loamy Wet Bottomland
Hydric soil rating: No

Minor Components

Cole

Percent of map unit: 5 percent
Hydric soil rating: No

Clear lake

Percent of map unit: 5 percent
Landform: Basin floors
Hydric soil rating: Yes

Unnamed

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

123—Feliz loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hgq7
Elevation: 400 to 1,500 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 54 to 59 degrees F
Frost-free period: 175 to 250 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Feliz and similar soils: 85 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Feliz

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 7 inches: loam
H2 - 7 to 26 inches: loam
H3 - 26 to 62 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.7 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R014XG918CA - Loamy Fan
Hydric soil rating: No

Minor Components

Pinnobie

Percent of map unit: 3 percent
Hydric soil rating: No

Cole

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Landform: Depressions
Hydric soil rating: Yes

Pinole

Percent of map unit: 2 percent
Hydric soil rating: No

Xerofluvents

Percent of map unit: 1 percent
Hydric soil rating: No

Russian, loam

Percent of map unit: 1 percent
Hydric soil rating: No

Talmage

Percent of map unit: 1 percent
Hydric soil rating: No

127—Fluvaquents, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: hgqc
Elevation: 5,000 to 7,500 feet
Mean annual precipitation: 10 to 30 inches
Mean annual air temperature: 45 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Fluvaquents and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fluvaquents

Setting

Landform: Flood plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Flat

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile
H1 - 0 to 10 inches: gravelly very fine sandy loam
H2 - 10 to 60 inches: variable

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: R014XG907CA - Loamy Bottom
Hydric soil rating: Yes

Minor Components

Gielow
Percent of map unit: 5 percent
Hydric soil rating: No

Haplaquepts
Percent of map unit: 5 percent
Landform: Basin floors
Hydric soil rating: Yes

Cole
Percent of map unit: 5 percent
Hydric soil rating: No

128—Gielow sandy loam, 0 to 5 percent slopes

Map Unit Setting
National map unit symbol: hgqd
Elevation: 500 to 1,750 feet
Mean annual precipitation: 44 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 175 to 250 days
Farmland classification: Prime farmland if irrigated and drained

Map Unit Composition

Gielow and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gielow

Setting

Landform: Alluvial flats, flood plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread, flat
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 4 inches: sandy loam
H2 - 4 to 11 inches: loam
H3 - 11 to 60 inches: stratified sandy loam to sandy clay loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: R014XG907CA - Loamy Bottom
Hydric soil rating: Yes

Minor Components

Clear lake

Percent of map unit: 3 percent
Landform: Basin floors
Hydric soil rating: Yes

Cole

Percent of map unit: 3 percent
Hydric soil rating: No

Feliz

Percent of map unit: 3 percent
Hydric soil rating: No

Russian

Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 2 percent
Hydric soil rating: No

Talmage

Percent of map unit: 2 percent
Hydric soil rating: No

146—Hopland-Sanhedrin-Kekawaka complex, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hgqz
Elevation: 400 to 5,000 feet
Mean annual precipitation: 30 to 65 inches
Mean annual air temperature: 48 to 59 degrees F
Frost-free period: 120 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Hopland and similar soils: 45 percent
Sanhedrin and similar soils: 20 percent
Kekawaka and similar soils: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hopland

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 12 inches: loam
H2 - 12 to 31 inches: clay loam
H3 - 31 to 35 inches: weathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 31 to 35 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F005XZ009CA - Very Deep Mesic Hills 40-60"ppt
Hydric soil rating: No

Description of Sanhedrin

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and siltstone

Typical profile

H1 - 0 to 13 inches: gravelly loam
H2 - 13 to 43 inches: gravelly clay loam
H3 - 43 to 47 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 43 to 47 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F005XZ021CA - Very Deep Gravelly Mesic Mountains 40-60"ppt
Hydric soil rating: No

Description of Kekawaka

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sandstone and siltstone

Typical profile

H1 - 0 to 4 inches: loam
H2 - 4 to 35 inches: clay loam
H3 - 35 to 61 inches: clay

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F005XZ009CA - Very Deep Mesic Hills 40-60"ppt
Hydric soil rating: No

Minor Components

Bearwallow

Percent of map unit: 2 percent
Hydric soil rating: No

Cummiskey

Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 2 percent
Hydric soil rating: No

Witherell

Percent of map unit: 2 percent
Hydric soil rating: No

Wohly

Percent of map unit: 2 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent
Hydric soil rating: No

Woodin

Percent of map unit: 2 percent
Hydric soil rating: No

Yorkville

Percent of map unit: 2 percent
Hydric soil rating: No

Casabonne

Percent of map unit: 2 percent
Hydric soil rating: No

Speaker

Percent of map unit: 2 percent

Hydric soil rating: No

149—Hopland-Witherell-Ashokawna complex, 30 to 50 percent slopes, MLRA 5

Map Unit Setting

National map unit symbol: 2w91t
Elevation: 900 to 2,710 feet
Mean annual precipitation: 37 to 85 inches
Mean annual air temperature: 54 to 60 degrees F
Frost-free period: 150 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Hopland and similar soils: 35 percent
Witherell and similar soils: 30 percent
Ashokawna and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hopland

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Colluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 3 inches: loam
AB - 3 to 16 inches: loam
Bt1 - 16 to 23 inches: loam
Bt2 - 23 to 31 inches: clay loam
C - 31 to 41 inches: paragravel

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F015XY010CA - Hills >40"ppt
Hydric soil rating: No

Description of Witherell

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Upper third of mountainflank, crest
Down-slope shape: Concave, convex
Across-slope shape: Concave, convex
Parent material: Colluvium derived from sandstone and/or residuum weathered from sandstone

Typical profile

A - 0 to 1 inches: loam
Bw - 1 to 7 inches: loam
Bt - 7 to 12 inches: loam
C - 12 to 79 inches: gravel

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 10 to 14 inches to abrupt textural change
Drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R015XD103CA - Shallow Loamy (Annual Grass)
Hydric soil rating: No

Description of Ashokawna

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave, convex
Across-slope shape: Concave, convex

Parent material: Colluvium derived from sandstone and/or residuum weathered from sandstone

Typical profile

A - 0 to 7 inches: gravelly loam
BA - 7 to 18 inches: very gravelly loam
Bt1 - 18 to 28 inches: very gravelly clay loam
Bt2 - 28 to 32 inches: very gravelly clay loam
R - 32 to 38 inches: bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R015XD104CA - Very Gravelly Loamy (Annual Grass)
Hydric soil rating: No

Minor Components

Etsel

Percent of map unit: 4 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave, convex
Across-slope shape: Concave, convex
Hydric soil rating: No

Bearwallow

Percent of map unit: 4 percent
Landform: Hills, mountains
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave, convex
Across-slope shape: Concave, convex
Hydric soil rating: No

Yorktree

Percent of map unit: 4 percent
Landform: Hills, mountains
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave, convex
Across-slope shape: Concave, convex
Hydric soil rating: No

Rock outcrop

Percent of map unit: 3 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

150—Hopland-Wohly loams, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hgr3
Elevation: 400 to 3,500 feet
Mean annual precipitation: 30 to 60 inches
Mean annual air temperature: 54 to 59 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Hopland and similar soils: 65 percent
Wohly and similar soils: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hopland

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 12 inches: loam
H2 - 12 to 31 inches: clay loam
H3 - 31 to 35 inches: weathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 31 to 35 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F005XZ009CA - Very Deep Mesic Hills 40-60"ppt
Hydric soil rating: No

Description of Wohly

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Typical profile

A1 - 0 to 5 inches: loam
A2 - 5 to 11 inches: loam
Bt1 - 11 to 17 inches: gravelly clay loam
Bt2 - 17 to 24 inches: gravelly clay loam
Ct - 24 to 71 inches: gravel

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 24 to 28 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F005XZ009CA - Very Deep Mesic Hills 40-60"ppt
Hydric soil rating: No

Minor Components

Bearwallow

Percent of map unit: 4 percent
Hydric soil rating: No

Casabonne

Percent of map unit: 4 percent

Hydric soil rating: No

Rock outcrop

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

Hellman

Percent of map unit: 3 percent
Hydric soil rating: No

Ashokawna

Percent of map unit: 3 percent
Hydric soil rating: No

177—Pinole gravelly loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hgrz
Elevation: 500 to 1,500 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Pinole and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pinole

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 10 inches: gravelly loam
H2 - 10 to 37 inches: gravelly clay loam
H3 - 37 to 61 inches: gravelly sandy clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: R014XG912CA - Loamy Terrace
Hydric soil rating: No

Minor Components

Pinnobie

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

Yokayo

Percent of map unit: 5 percent
Hydric soil rating: No

178—Pinole gravelly loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: hgs0
Elevation: 500 to 1,500 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Pinole and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pinole

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 10 inches: gravelly loam
H2 - 10 to 37 inches: gravelly clay loam
H3 - 37 to 61 inches: gravelly sandy clay loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R014XG912CA - Loamy Terrace
Hydric soil rating: No

Minor Components

Yokayo

Percent of map unit: 5 percent
Landform: Terraces
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

Pinnobie

Percent of map unit: 5 percent
Landform: Terraces
Hydric soil rating: No

188—Russian loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hgsb
Elevation: 500 to 1,500 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 225 to 250 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Russian and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Russian

Setting

Landform: Flood plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 38 inches: loam
H2 - 38 to 60 inches: stratified very fine sandy loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R014XG907CA - Loamy Bottom
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Cole

Percent of map unit: 3 percent
Hydric soil rating: No

Feliz

Percent of map unit: 3 percent
Hydric soil rating: No

Riverwash

Percent of map unit: 2 percent
Landform: Channels

Hydric soil rating: Yes

Xerofluvents

Percent of map unit: 2 percent
Landform: Fans
Hydric soil rating: Yes

203—Talmage gravelly sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hgst
Elevation: 300 to 1,800 feet
Mean annual precipitation: 25 to 55 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 150 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Talmage and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Talmage

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 9 inches: gravelly sandy loam
H2 - 9 to 33 inches: stratified very gravelly coarse sandy loam to very gravelly loam
H3 - 33 to 66 inches: stratified very gravelly coarse sand to very gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: R014XD083CA - Very Gravelly Loamy Bottomland
Hydric soil rating: No

Minor Components

Riverwash

Percent of map unit: 5 percent
Landform: Channels
Hydric soil rating: Yes

Russian

Percent of map unit: 5 percent
Hydric soil rating: No

Xerofluvents

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

207—Updegraff-Sanhedrin complex, 15 to 50 percent slopes

Map Unit Setting

National map unit symbol: hgsy
Elevation: 1,500 to 3,000 feet
Mean annual precipitation: 40 to 65 inches
Mean annual air temperature: 53 to 58 degrees F
Frost-free period: 150 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Updegraff and similar soils: 35 percent
Sanhedrin and similar soils: 30 percent
Minor components: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Updegraff

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Colluvium derived from schist and/or colluvium derived from graywacke and/or residuum weathered from schist and/or residuum weathered from graywacke

Typical profile

H1 - 0 to 12 inches: gravelly loam
H2 - 12 to 22 inches: gravelly clay loam
H3 - 22 to 36 inches: gravelly clay loam
H4 - 36 to 45 inches: gravelly clay loam
H5 - 45 to 49 inches: bedrock

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 45 to 49 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F005XZ008CA - Deep Mesic Hills 40-60"ppt
Hydric soil rating: No

Description of Sanhedrin

Setting

Landform: Mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Colluvium derived from siltstone and/or colluvium derived from sandstone and shale

Typical profile

H1 - 0 to 13 inches: gravelly loam
H2 - 13 to 43 inches: gravelly clay loam
H3 - 43 to 47 inches: bedrock

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 43 to 47 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C
Ecological site: F005XZ021CA - Very Deep Gravelly Mesic Mountains 40-60"ppt
Hydric soil rating: No

Minor Components

Kekawaka
Percent of map unit: 5 percent
Hydric soil rating: No

Nashmead
Percent of map unit: 5 percent
Hydric soil rating: No

Casabonne
Percent of map unit: 5 percent
Hydric soil rating: No

Maymen
Percent of map unit: 5 percent
Hydric soil rating: No

Woodin
Percent of map unit: 3 percent
Hydric soil rating: No

Wohly
Percent of map unit: 3 percent
Hydric soil rating: No

Updegraff
Percent of map unit: 3 percent
Hydric soil rating: No

Sanhedrin
Percent of map unit: 3 percent
Hydric soil rating: No

Yorktree
Percent of map unit: 2 percent
Hydric soil rating: No

Yorkville
Percent of map unit: 1 percent
Hydric soil rating: No

210—Urban land

Map Unit Setting

National map unit symbol: hgt1
Elevation: 500 to 1,400 feet
Mean annual precipitation: 35 to 55 inches
Mean annual air temperature: 54 to 57 degrees F

Frost-free period: 150 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Unnamed

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Xerofluvents

Percent of map unit: 2 percent
Landform: Flood plains
Hydric soil rating: Yes

Talmage

Percent of map unit: 1 percent
Hydric soil rating: No

Pinole

Percent of map unit: 1 percent
Hydric soil rating: No

Pinnobie

Percent of map unit: 1 percent
Hydric soil rating: No

Yokayo

Percent of map unit: 1 percent
Hydric soil rating: No

Cole

Percent of map unit: 1 percent
Hydric soil rating: No

Feliz

Percent of map unit: 1 percent
Hydric soil rating: No

218—Xerofluvents-Riverwash complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hgt9
Elevation: 340 to 2,510 feet
Mean annual precipitation: 30 to 60 inches
Mean annual air temperature: 54 to 59 degrees F
Frost-free period: 125 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Xerofluvents and similar soils: 50 percent
Riverwash: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xerofluvents

Setting

Landform: Flood plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium

Typical profile

H1 - 0 to 15 inches: sandy loam
H2 - 15 to 29 inches: sand
H3 - 29 to 48 inches: loam
H4 - 48 to 60 inches: gravelly sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Description of Riverwash

Setting

Landform: Channels
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 6 inches: variable
H2 - 6 to 60 inches: stratified coarse sand to sand

Properties and qualities

Slope: 0 to 2 percent
Drainage class: Excessively drained

Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to very high (0.01 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: FrequentNone

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Yes

Minor Components

Cole
Percent of map unit: 5 percent
Hydric soil rating: No

Feliz
Percent of map unit: 4 percent
Hydric soil rating: No

Russian
Percent of map unit: 3 percent
Hydric soil rating: No

Talmage
Percent of map unit: 3 percent
Hydric soil rating: No

222—Yokayo sandy loam, 8 to 15 percent slopes

Map Unit Setting
National map unit symbol: hgtf
Elevation: 500 to 1,500 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition
Yokayo and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yokayo

Setting
Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave

Across-slope shape: Convex
Parent material: Alluvium derived from sedimentary rock

Typical profile
H1 - 0 to 8 inches: sandy loam
H2 - 8 to 32 inches: clay
H3 - 32 to 60 inches: clay loam

Properties and qualities
Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 0.9 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R014XD101CA - Claypan
Hydric soil rating: No

Minor Components

Pinnobie
Percent of map unit: 4 percent
Hydric soil rating: No

Pinole
Percent of map unit: 4 percent
Hydric soil rating: No

Redvine
Percent of map unit: 4 percent
Hydric soil rating: No

Yokayo
Percent of map unit: 3 percent
Hydric soil rating: No

233—Yorkville-Ashokawna-Witherell complex, 30 to 50 percent slopes, MLRA 5

Map Unit Setting
National map unit symbol: 2w916
Elevation: 300 to 4,200 feet
Mean annual precipitation: 38 to 89 inches

Mean annual air temperature: 54 to 60 degrees F
Frost-free period: 150 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Yorkville and similar soils: 45 percent
Ashokawna and similar soils: 25 percent
Witherell and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yorkville

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from mica schist and/or residuum weathered from metamorphic and sedimentary rock

Typical profile

A1 - 0 to 4 inches: loam
A2 - 4 to 12 inches: loam
Bt1 - 12 to 17 inches: clay
Bt2 - 17 to 29 inches: clay
Bt3 - 29 to 62 inches: clay

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 20 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R015XD105CA - Clayey Unstable (Perennial Grass)
Hydric soil rating: No

Description of Ashokawna

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Colluvium derived from graywacke and/or colluvium derived from sandstone and/or residuum weathered from graywacke and/or residuum weathered from sandstone

Typical profile
A - 0 to 7 inches: gravelly loam
BA - 7 to 18 inches: very gravelly loam
Bt1 - 18 to 28 inches: very gravelly clay loam
Bt2 - 28 to 32 inches: very gravelly clay loam
R - 32 to 38 inches: bedrock

Properties and qualities
Slope: 30 to 50 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R015XD104CA - Very Gravelly Loamy (Annual Grass)
Hydric soil rating: No

Description of Witherell

Setting
Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Upper third of mountainflank, crest
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Colluvium derived from sandstone and/or residuum weathered from sandstone

Typical profile
A - 0 to 1 inches: loam
Bw - 1 to 7 inches: loam
Bt - 7 to 12 inches: loam
C - 12 to 79 inches: gravel

Properties and qualities
Slope: 30 to 50 percent
Depth to restrictive feature: 10 to 14 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R015XD103CA - Shallow Loamy (Annual Grass)
Hydric soil rating: No

Minor Components

Bearwallow
Percent of map unit: 3 percent
Landform: Hills, mountains
Landform position (three-dimensional): Mountainflank, side slope
Hydric soil rating: No

Hopland
Percent of map unit: 3 percent
Landform: Hills, mountains
Landform position (three-dimensional): Mountainflank, side slope
Hydric soil rating: No

Cummiskey
Percent of map unit: 3 percent
Landform: Hills, mountains
Landform position (three-dimensional): Mountainflank, side slope
Hydric soil rating: No

Yorktree
Percent of map unit: 2 percent
Landform: Hills, mountains
Landform position (three-dimensional): Mountainflank, side slope
Hydric soil rating: No

Rock outcrop
Percent of map unit: 2 percent
Hydric soil rating: No

Montara
Percent of map unit: 2 percent
Landform: Hills, mountains
Landform position (three-dimensional): Mountainflank, side slope
Hydric soil rating: No

234—Yorkville-Yorktree-Ashokawna complex, 15 to 30 percent slopes, MLRA 5

Map Unit Setting

National map unit symbol: 2w917
Elevation: 300 to 3,300 feet
Mean annual precipitation: 40 to 89 inches
Mean annual air temperature: 52 to 59 degrees F
Frost-free period: 150 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Yorkville and similar soils: 45 percent
Yorktree and similar soils: 25 percent
Ashokawna and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yorkville

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from mica schist and/or residuum weathered from metamorphic and sedimentary rock

Typical profile

A1 - 0 to 4 inches: loam
A2 - 4 to 12 inches: loam
Bt1 - 12 to 17 inches: clay
Bt2 - 17 to 29 inches: clay
Bt3 - 29 to 62 inches: clay

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 20 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R015XD105CA - Clayey Unstable (Perennial Grass)
Hydric soil rating: No

Description of Yorktree

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Colluvium derived from graywacke and/or colluvium derived from sandstone and siltstone and/or colluvium derived from shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 12 inches: loam
Bt1 - 12 to 25 inches: gravelly clay
Bt2 - 25 to 39 inches: gravelly clay
Bt3 - 39 to 47 inches: gravelly clay loam
C1 - 47 to 59 inches: gravelly clay loam
C2 - 59 to 79 inches: gravel

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 39 to 59 inches to abrupt textural change
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F015XY015CA - Loamy Mountains >40"ppt
Hydric soil rating: No

Description of Ashokawna

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Colluvium derived from graywacke and/or colluvium derived from sandstone and/or residuum weathered from graywacke and/or residuum weathered from sandstone

Typical profile

A - 0 to 7 inches: gravelly loam
BA - 7 to 18 inches: very gravelly loam
Bt1 - 18 to 28 inches: very gravelly clay loam
Bt2 - 28 to 32 inches: very gravelly clay loam
R - 32 to 38 inches: bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R015XD104CA - Very Gravelly Loamy (Annual Grass)
Hydric soil rating: No

Minor Components

Bearwallow

Percent of map unit: 3 percent
Landform: Hills, mountains
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Hopland

Percent of map unit: 3 percent
Landform: Hills, mountains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Witherell

Percent of map unit: 3 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Upper third of mountainflank, crest
Down-slope shape: Concave
Across-slope shape: Convex
Hydric soil rating: No

Sanhedrin

Percent of map unit: 2 percent
Landform: Hills, mountains
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Montara

Percent of map unit: 2 percent
Landform: Ridges
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent
Landform: Hills, mountains
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

236—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

1340—Haploxeralfs-Argixerolls complex, 0 to 9 percent slopes, low ffd

Map Unit Setting

National map unit symbol: 2xkbc
Elevation: 1,390 to 2,480 feet
Mean annual precipitation: 43 to 69 inches
Mean annual air temperature: 55 to 58 degrees F
Frost-free period: 194 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Haploxeralfs and similar soils: 60 percent
Argixerolls and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Haploxeralfs

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

A - 0 to 3 inches: sandy loam
Bt - 3 to 30 inches: loam
C1 - 30 to 37 inches: gravelly sandy loam
C2 - 37 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): 5w
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: R014XG912CA - Loamy Terrace
Hydric soil rating: No

Description of Argixerolls

Setting

Landform: Terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 11 inches: gravelly loam
Bt1 - 11 to 22 inches: gravelly clay loam
Bt2 - 22 to 37 inches: gravelly clay loam
2Bt1 - 37 to 60 inches: clay

Properties and qualities

Slope: 0 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R014XG912CA - Loamy Terrace
Hydric soil rating: No

Minor Components

Feliz
Percent of map unit: 10 percent
Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

2150—Xerochrepts-Haploxeralfs-Argixerolls complex, 9 to 30 percent slopes, low ffd

Map Unit Setting
National map unit symbol: 2y4jp
Elevation: 1,480 to 2,490 feet
Mean annual precipitation: 43 to 67 inches
Mean annual air temperature: 55 to 57 degrees F
Frost-free period: 180 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition
Xerochrepts and similar soils: 35 percent
Haploxeralfs and similar soils: 30 percent
Argixerolls and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xerochrepts

Setting
Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

A - 0 to 12 inches: gravelly loam
Bw - 12 to 36 inches: very gravelly loam
C - 36 to 72 inches: stratified very gravelly gravelly loam to sandy clay loam

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.40 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Haploxeralfs

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

A - 0 to 3 inches: sandy loam
Bt - 3 to 30 inches: loam
C1 - 30 to 37 inches: gravelly sandy loam
C2 - 37 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Argixerolls

Setting

Landform: Terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

A - 0 to 11 inches: gravelly loam
Bt1 - 11 to 22 inches: gravelly clay loam
Bt2 - 22 to 37 inches: gravelly clay loam
2Bt1 - 37 to 60 inches: clay

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Talmage

Percent of map unit: 4 percent
Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R014XD083CA - Very Gravelly Loamy Bottomland
Hydric soil rating: No

Gielow

Percent of map unit: 3 percent
Landform: Alluvial flats, flood plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread, flat
Down-slope shape: Linear

Across-slope shape: Linear
Hydric soil rating: Yes

Redvine

Percent of map unit: 3 percent
Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

2160—Xerochrepts-Haploxeralfs-Argixerolls complex, 30 to 50 percent slopes, low ffd

Map Unit Setting

National map unit symbol: 2y4jr
Elevation: 1,560 to 2,640 feet
Mean annual precipitation: 46 to 61 inches
Mean annual air temperature: 55 to 59 degrees F
Frost-free period: 200 to 225 days
Farmland classification: Not prime farmland

Map Unit Composition

Xerochrepts and similar soils: 35 percent
Haploxeralfs and similar soils: 30 percent
Argixerolls and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xerochrepts

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

A - 0 to 12 inches: gravelly loam
Bw - 12 to 36 inches: very gravelly loam
C - 36 to 72 inches: stratified very gravelly gravelly loam to sandy clay loam

Properties and qualities

Slope: 30 to 50 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.40 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Haploxeralfs

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

A - 0 to 3 inches: sandy loam
Bt - 3 to 30 inches: loam
C1 - 30 to 37 inches: gravelly sandy loam
C2 - 37 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Argixerolls

Setting

Landform: Terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave

Across-slope shape: Convex
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

A - 0 to 11 inches: gravelly loam
Bt1 - 11 to 22 inches: gravelly clay loam
Bt2 - 22 to 37 inches: gravelly clay loam
2Bt1 - 37 to 60 inches: clay

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Redvine

Percent of map unit: 5 percent
Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Yorkville

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave, convex
Across-slope shape: Concave, convex
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Physical Properties

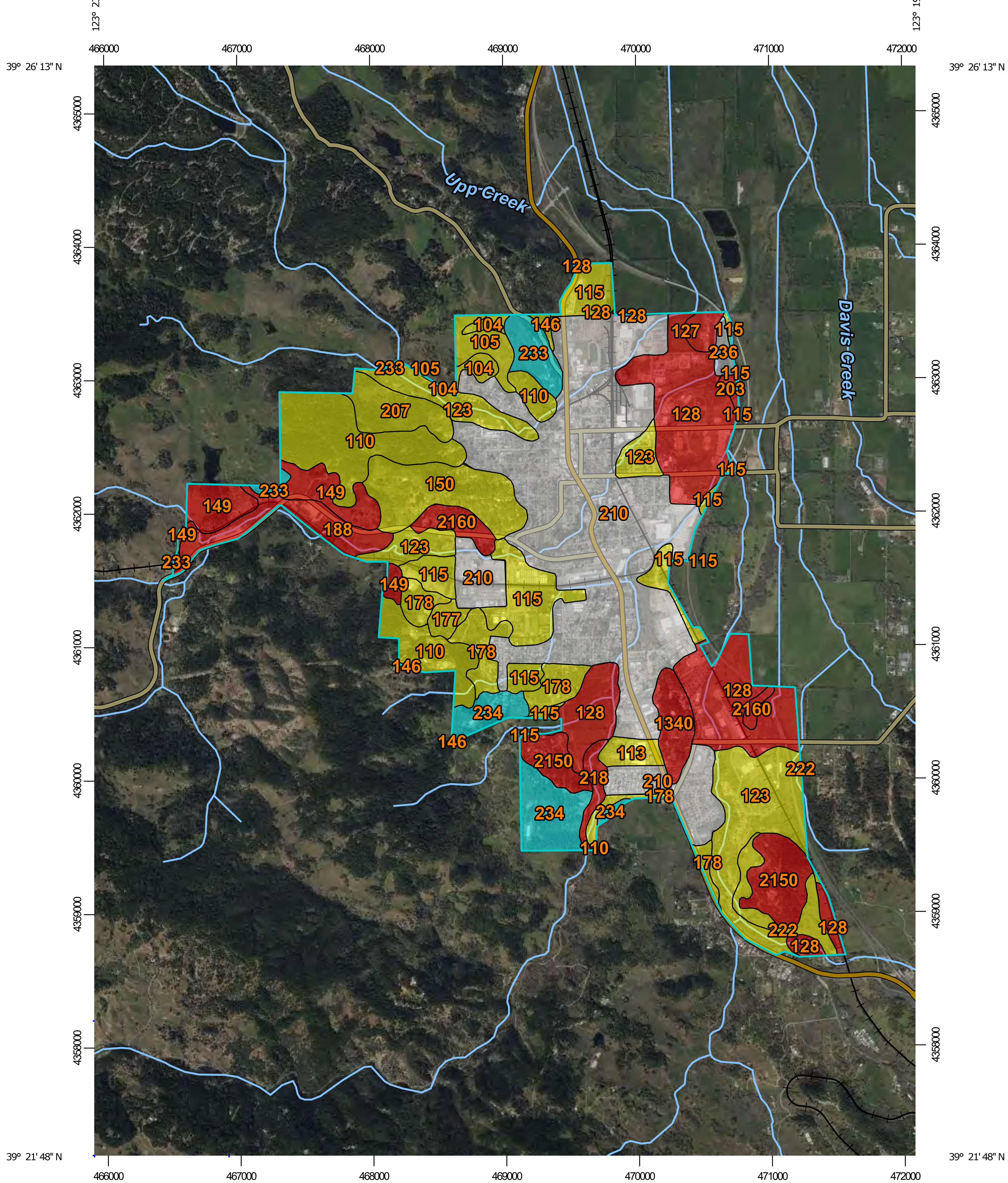
Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Linear Extensibility (Willits with Proposed SOI)

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—Linear Extensibility (Willits with Proposed SOI)



Map Scale: 1:39,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 1500, 3000, 6000, 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Low (0 - 3)
- Moderate (3 - 6)
- High (6 - 9)
- Very High (9 - 30)
- Not rated or not available

Soil Rating Lines
- Low (0 - 3)
- Moderate (3 - 6)
- High (6 - 9)
- Very High (9 - 30)
- Not rated or not available

Soil Rating Points
- Low (0 - 3)
- Moderate (3 - 6)
- High (6 - 9)
- Very High (9 - 30)
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mendocino County, Eastern Part and Southwestern Part of Trinity County, California
Survey Area Data: Version 18, Sep 7, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 7, 2022—May 31, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Linear Extensibility (Willits with Proposed SOI)

Map unit symbol	Map unit name	Rating (percent)	Acres in AOI	Percent of AOI
104	Bearwallow-Hellman loams, 15 to 30 percent slopes	3.8	18.8	0.7%
105	Bearwallow-Hellman-Witherell complex, 30 to 50 percent slopes	3.8	31.1	1.1%
110	Casabonne-Wohly loams, 30 to 50 percent slopes	3.2	212.4	7.7%
113	Cole loam, drained, 0 to 2 percent slopes, MLRA 14	4.7	31.8	1.2%
115	Cole silty clay loam, 0 to 1 percent slopes, MLRA 14	3.6	164.2	6.0%
123	Feliz loam, 0 to 2 percent slopes	4.2	253.9	9.2%
127	Fluvaquents, 0 to 1 percent slopes	1.5	16.2	0.6%
128	Gielow sandy loam, 0 to 5 percent slopes	1.5	366.3	13.3%
146	Hopland-Sanhedrin-Kekawaka complex, 30 to 50 percent slopes	3.4	4.6	0.2%
149	Hopland-Witherell-Ashokawna complex, 30 to 50 percent slopes, MLRA 5	1.5	89.0	3.2%
150	Hopland-Wohly loams, 30 to 50 percent slopes	3.4	113.8	4.1%
177	Pinole gravelly loam, 0 to 2 percent slopes	4.0	14.6	0.5%
178	Pinole gravelly loam, 2 to 8 percent slopes	4.0	87.4	3.2%
188	Russian loam, 0 to 2 percent slopes	1.5	69.8	2.5%
203	Talmage gravelly sandy loam, 0 to 2 percent slopes	1.5	5.8	0.2%
207	Updegraff-Sanhedrin complex, 15 to 50 percent slopes	3.7	56.3	2.0%
210	Urban land		827.1	30.0%
218	Xerofluvents-Riverwash complex, 0 to 2 percent slopes	1.5	18.8	0.7%

Map unit symbol	Map unit name	Rating (percent)	Acres in AOI	Percent of AOI
222	Yokayo sandy loam, 8 to 15 percent slopes	5.3	41.0	1.5%
233	Yorkville-Ashokawna-Witherell complex, 30 to 50 percent slopes, MLRA 5	6.4	46.2	1.7%
234	Yorkville-Yorktree-Ashokawna complex, 15 to 30 percent slopes, MLRA 5	6.4	97.8	3.5%
236	Water		11.5	0.4%
1340	Haploxeralfs-Argixerolls complex, 0 to 9 percent slopes, low ffd	1.2	43.6	1.6%
2150	Xerochrepts-Haploxeralfs-Argixerolls complex, 9 to 30 percent slopes, low ffd	1.5	96.3	3.5%
2160	Xerochrepts-Haploxeralfs-Argixerolls complex, 30 to 50 percent slopes, low ffd	1.5	35.6	1.3%
Totals for Area of Interest			**2,753.8**	**100.0%**

Rating Options—Linear Extensibility (Willits with Proposed SOI)

Units of Measure: percent

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): All Layers (Weighted Average)

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Erosion

This folder contains a collection of tabular reports that present soil erosion factors and groupings. The reports (tables) include all selected map units and components for each map unit. Soil erosion factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

RUSLE2 Related Attributes (Willits with Proposed SOI)

This report summarizes those soil attributes used by the Revised Universal Soil Loss Equation Version 2 (RUSLE2) for the map units in the selected area. The report includes the map unit symbol, the component name, and the percent of the component in the map unit. Soil property data for each map unit component include the hydrologic soil group, erosion factor Kf for the surface horizon, erosion factor T, and the representative percentage of sand, silt, and clay in the mineral surface horizon. Missing surface data may indicate the presence of an organic layer.

Report—RUSLE2 Related Attributes (Willits with Proposed SOI)

Soil properties and interpretations for erosion runoff calculations. The surface mineral horizon properties are displayed or the first mineral horizon below an organic surface horizon. Organic horizons are not displayed.

RUSLE2 Related Attributes–Mendocino County, Eastern Part and Southwestern Part of Trinity County, California								
Map symbol and soil name	Pct. of map unit	Slope length (ft)	Hydrologic group	Kf	T factor	Representative value		
						% Sand	% Silt	% Clay
104—Bearwallow-Hellman loams, 15 to 30 percent slopes								
Bearwallow	40	—	C	.37	3	42.1	37.9	20.0
Hellman	30	—	C	.37	5	39.8	37.7	22.5

RUSLE2 Related Attributes–Mendocino County, Eastern Part and Southwestern Part of Trinity County, California								
Map symbol and soil name	Pct. of map unit	Slope length (ft)	Hydrologic group	Kf	T factor	Representative value		
						% Sand	% Silt	% Clay
105—Bearwallow-Hellman-Witherell complex, 30 to 50 percent slopes								
Bearwallow	35	—	C	.37	3	42.1	37.9	20.0
Hellman	25	—	C	.37	5	39.8	37.7	22.5
Witherell	15	—	D	.15	1	65.1	18.9	16.0
110—Casabonne-Wohly loams, 30 to 50 percent slopes								
Casabonne	50	—	C	.28	3	41.6	37.4	21.0
Wohly	30	—	C	.32	4	42.1	37.9	20.0
113—Cole loam, drained, 0 to 2 percent slopes, MLRA 14								
Cole	85	200	C	.37	5	42.0	38.0	20.0
115—Cole silty clay loam, 0 to 1 percent slopes, MLRA 14								
Cole	85	98	C	.20	5	14.0	55.0	31.0
123—Feliz loam, 0 to 2 percent slopes								
Feliz	85	—	B	.28	5	39.8	37.7	22.5
127—Fluvaquents, 0 to 1 percent slopes								
Fluvaquents	85	—	B/D	.37	5	58.6	22.9	18.5
128—Gielow sandy loam, 0 to 5 percent slopes								
Gielow	85	—	B/D	.20	5	66.5	15.0	18.5
146—Hopland-Sanhedrin-Kekawaka complex, 30 to 50 percent slopes								
Hopland	45	—	C	.32	3	42.1	37.9	20.0
Sanhedrin	20	—	C	.28	3	41.4	37.1	21.5
Kekawaka	15	—	C	.28	5	39.2	37.3	23.5
149—Hopland-Witherell-Ashokawna complex, 30 to 50 percent slopes, MLRA 5								
Hopland	35	—	C	.20	3	43.2	38.8	18.0
Witherell	30	—	D	.24	1	43.2	38.8	18.0
Ashokawna	20	—	C	.32	2	40.0	37.0	23.0
150—Hopland-Wohly loams, 30 to 50 percent slopes								
Hopland	65	—	C	.32	3	42.1	37.9	20.0
Wohly	15	—	C	.32	2	42.1	37.9	20.0

RUSLE2 Related Attributes–Mendocino County, Eastern Part and Southwestern Part of Trinity County, California								
Map symbol and soil name	Pct. of map unit	Slope length (ft)	Hydrologic group	Kf	T factor	Representative value		
						% Sand	% Silt	% Clay
177—Pinole gravelly loam, 0 to 2 percent slopes								
Pinole	85	—	C	.37	5	41.4	37.1	21.5
178—Pinole gravelly loam, 2 to 8 percent slopes								
Pinole	85	—	C	.37	5	41.4	37.1	21.5
188—Russian loam, 0 to 2 percent slopes								
Russian	85	—	B	.37	5	44.3	40.7	15.0
203—Talmage gravelly sandy loam, 0 to 2 percent slopes								
Talmage	85	—	A	.24	3	65.7	22.8	11.5
207—Updegraff-Sanhedrin complex, 15 to 50 percent slopes								
Updegraff	35	—	C	.32	3	42.1	37.9	20.0
Sanhedrin	30	—	C	.28	3	41.4	37.1	21.5
218—Xerofluvents-Riverwash complex, 0 to 2 percent slopes								
Xerofluvents	50	—	A/D	.20	5	68.8	23.7	7.5
222—Yokayo sandy loam, 8 to 15 percent slopes								
Yokayo	85	—	D	.32	5	65.1	18.9	16.0
233—Yorkville-Ashokawna-Witherell complex, 30 to 50 percent slopes, MLRA 5								
Yorkville	45	—	C	.32	5	38.0	37.0	25.0
Ashokawna	25	—	C	.32	2	40.0	37.0	23.0
Witherell	15	—	D	.24	1	43.2	38.8	18.0
234—Yorkville-Yorktree-Ashokawna complex, 15 to 30 percent slopes, MLRA 5								
Yorkville	45	—	D	.32	5	38.0	37.0	25.0
Yorktree	25	—	C	.32	3	38.0	37.0	25.0
Ashokawna	15	—	C	.32	2	40.0	37.0	23.0
1340—Haploxeralfs-Argixerolls complex, 0 to 9 percent slopes, low ffd								
Haploxeralfs	60	161	B	.24	4	67.0	20.0	13.0
Argixerolls	30	161	C	.37	5	44.0	41.0	15.0
Feliz	10	161	B	.28	5	38.0	37.0	25.0

RUSLE2 Related Attributes–Mendocino County, Eastern Part and Southwestern Part of Trinity County, California								
Map symbol and soil name	**Pct. of map unit**	**Slope length (ft)**	**Hydrologic group**	**Kf**	**T factor**	**Representative value**		
						% Sand	**% Silt**	**% Clay**
2150—Xerochrepts-Haploxeralfs-Argixerolls complex, 9 to 30 percent slopes, low ffd								
Xerochrepts	35	49	B	.24	5	40.0	37.0	23.0
Haploxeralfs	30	49	B	.24	4	67.0	20.0	13.0
Argixerolls	25	49	C	.37	5	44.0	41.0	15.0
Talmage	4	200	B	.24	5	66.0	22.0	12.0
Gielow	3	200	B/D	.20	5	66.0	15.0	19.0
Redvine	3	49	C	.24	5	57.0	18.0	25.0
2160—Xerochrepts-Haploxeralfs-Argixerolls complex, 30 to 50 percent slopes, low ffd								
Xerochrepts	35	49	B	.24	5	40.0	37.0	23.0
Haploxeralfs	30	49	B	.24	4	67.0	20.0	13.0
Argixerolls	25	49	C	.37	5	44.0	41.0	15.0
Redvine	5	49	C	.24	5	57.0	18.0	25.0
Yorkville	5	49	C	.32	5	39.0	37.0	24.0

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the following National Soil Survey Handbook link: "National Soil Survey Handbook."

ABC soil

A soil having an A, a B, and a C horizon.

Ablation till

Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

AC soil

A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil

The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil

Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone

A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.

Alluvial fan

A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium

Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl

A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM)

The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions

Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon

A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo

The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect

The direction toward which a slope faces. Also called slope aspect.

Association, soil

A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity)

The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low: 0 to 3
Low: 3 to 6
Moderate: 6 to 9
High: 9 to 12
Very high: More than 12

Backslope

The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp

A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland

A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada

A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area

The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation

The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology)

A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane

A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedding system

A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock

The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography

A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace

A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum

Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout (map symbol)

A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed. The adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Borrow pit (map symbol)

An open excavation from which soil and underlying material have been removed, usually for construction purposes.

Bottom land

An informal term loosely applied to various portions of a flood plain.

Boulders

Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks

A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height

An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management

Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte

An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding

A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil

A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche

A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR)

The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy

The leafy crown of trees or shrubs. (See Crown.)

Canyon

A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water

Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena

A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation

An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity

The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps

See Terracettes.

Cement rock

Shaly limestone used in the manufacture of cement.

Channery soil material

Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment

Control of unwanted vegetation through the use of chemicals.

Chiseling

Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque

A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).

Clay

As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions

See Redoximorphic features.

Clay film

A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay spot (map symbol)

A spot where the surface texture is silty clay or clay in areas where the surface layer of the soils in the surrounding map unit is sandy loam, loam, silt loam, or coarser.

Claypan

A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community

The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil

Sand or loamy sand.

Cobble (or cobblestone)

A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material

Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility)

See Linear extensibility.

Colluvium

Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope

Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil

A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions

See Redoximorphic features.

Conglomerate

A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system

Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage

A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil

Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping

Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section

The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat)

A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology)

A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations)

Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop

A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management

Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system

Growing crops according to a planned system of rotation and management practices.

Cross-slope farming

Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown

The upper part of a tree or shrub, including the living branches and their foliage.

Cryoturbate

A mass of soil or other unconsolidated earthy material moved or disturbed by frost action. It is typically coarser than the underlying material.

Cuesta

An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Culmination of the mean annual increment (CMAI)

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave

The walls of excavations tend to cave in or slough.

Decreasers

The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing

Postponing grazing or resting grazing land for a prescribed period.

Delta

A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer

A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression, closed (map symbol)

A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and that does not have a natural outlet for surface drainage.

Depth, soil

Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement

A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth

A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope

A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace)

A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming

A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural)

Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface

Runoff, or surface flow of water, from an area.

Drainageway

A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw

A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Drift

A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin

A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Duff

A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune

A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill

See Mine spoil.

Ecological site

An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation

The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation

A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit

Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream

A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation

A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion

The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (accelerated)

Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic)

Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement

A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface

A land surface shaped by the action of erosion, especially by running water.

Escarpment

A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Escarpment, bedrock (map symbol)

A relatively continuous and steep slope or cliff, produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.

Escarpment, nonbedrock (map symbol)

A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.

Esker

A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Extrusive rock

Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth's surface.

Fallow

Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant

A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil

The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat)

The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity

The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope

A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil

Sandy clay, silty clay, or clay.

Firebreak

An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom

An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material

Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone

A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain

The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms

A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay

A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step

An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial

Of or pertaining to rivers or streams; produced by stream or river action.

Foothills

A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope

The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb

Any herbaceous plant not a grass or a sedge.

Forest cover

All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type

A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan

A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil

The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai

Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glaciofluvial deposits

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits

Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil

Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping

Growing crops in strips that grade toward a protected waterway.

Grassed waterway

A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel

Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravel pit (map symbol)

An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel.

Gravelly soil material

Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol)

A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area that has less than 15 percent rock fragments.

Green manure crop (agronomy)

A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water

Water filling all the unblocked pores of the material below the water table.

Gully (map symbol)

A small, steep-sided channel caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage whereas a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock

Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim

Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan

A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology)

A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat)

Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops

Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill

A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope

A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil

A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon: An organic layer of fresh and decaying plant residue.

L horizon: A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon: The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon: The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon: The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon: The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon: Soft, consolidated bedrock beneath the soil.

R layer: Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

M layer: A root-limiting subsoil layer consisting of nearly continuous, horizontally oriented, human-manufactured materials.

W layer: A layer of water within or beneath the soil.

Humus

The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups

Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock

Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation

The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil

A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers

Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration

The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity

The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate

The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate

The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Very low: Less than 0.2
Low: 0.2 to 0.4
Moderately low: 0.4 to 0.75
Moderate: 0.75 to 1.25
Moderately high: 1.25 to 1.75
High: 1.75 to 2.5
Very high: More than 2.5

Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology)

A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream

A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders

On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions

See Redoximorphic features.

Irrigation

Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin: Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border: Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding: Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation: Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle): Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow: Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler: Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation: Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding: Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame

A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Karst (topography)

A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll

A small, low, rounded hill rising above adjacent landforms.

Ksat

See Saturated hydraulic conductivity.

Lacustrine deposit

Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain

A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace

A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol)

An area of accumulated waste products of human habitation, either above or below natural ground level.

Landslide

A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones

Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava flow (map symbol)

A solidified, commonly lobate body of rock formed through lateral, surface outpouring of molten lava from a vent or fissure.

Leaching

The removal of soluble material from soil or other material by percolating water.

Levee (map symbol)

An embankment that confines or controls water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility

Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^{1}/_{3}$- or $^{1}/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit

The moisture content at which the soil passes from a plastic to a liquid state.

Loam

Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess

Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength

The soil is not strong enough to support loads.

Low-residue crops

Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl

An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Marsh or swamp (map symbol)

A water-saturated, very poorly drained area that is intermittently or permanently covered by water. Sedges, cattails, and rushes are the dominant vegetation in marshes, and trees or shrubs are the dominant vegetation in swamps. Not used in map units where the named soils are poorly drained or very poorly drained.

Mass movement

A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses

See Redoximorphic features.

Meander belt

The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar

A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll

One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment

Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil

Very fine sandy loam, loam, silt loam, or silt.

Mesa

A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock

Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth's crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol)

An open excavation from which soil and underlying material have been removed and in which bedrock is exposed. Also denotes surface openings to underground mines.

Mine spoil

An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil

Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage

Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area

A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous water (map symbol)

Small, constructed bodies of water that are used for industrial, sanitary, or mining applications and that contain water most of the year.

Moderately coarse textured soil

Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil

Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon

A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine

In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil

The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil

Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain

A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Muck

Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat

See Hemic soil material.

Mudstone

A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation

A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon

A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil

A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules

See Redoximorphic features.

Nose slope (geomorphology)

A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant

Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter

Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low: Less than 0.5 percent
Low: 0.5 to 1.0 percent
Moderately low: 1.0 to 2.0 percent
Moderate: 2.0 to 4.0 percent
High: 4.0 to 8.0 percent
Very high: More than 8.0 percent

Outwash

Stratified and sorted sediments (chiefly sand and gravel) removed or "washed out" from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain

An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace

An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan

A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material

The unconsolidated organic and mineral material in which soil forms.

Peat

Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped

An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment

A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon

The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation

The movement of water through the soil.

Perennial water (map symbol)

Small, natural or constructed lakes, ponds, or pits that contain water most of the year.

Permafrost

Ground, soil, or rock that remains at or below 0 degrees C for at least 2 years. It is defined on the basis of temperature and is not necessarily frozen.

pH value

A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil

A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping

Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting

Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit

The moisture content at which a soil changes from semisolid to plastic.

Plasticity index

The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology)

A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa

The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite

The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan

A compacted layer formed in the soil directly below the plowed layer.

Ponding

Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded

Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings

See Redoximorphic features.

Potential native plant community

See Climax plant community.

Potential rooting depth (effective rooting depth)

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning

Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil

The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil

A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use

Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland

Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil

A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid: Less than 3.5
Extremely acid: 3.5 to 4.4
Very strongly acid: 4.5 to 5.0
Strongly acid: 5.1 to 5.5
Moderately acid: 5.6 to 6.0
Slightly acid: 6.1 to 6.5
Neutral: 6.6 to 7.3
Slightly alkaline: 7.4 to 7.8
Moderately alkaline: 7.9 to 8.4
Strongly alkaline: 8.5 to 9.0
Very strongly alkaline: 9.1 and higher

Red beds

Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations

See Redoximorphic features.

Redoximorphic depletions

See Redoximorphic features.

Redoximorphic features

Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
    A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
    B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
    C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
    A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
    B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix

See Redoximorphic features.

Regolith

All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief

The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material)

Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill

A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser

The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut

A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments

Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol)

An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit.

Root zone

The part of the soil that can be penetrated by plant roots.

Runoff

The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil

A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline spot (map symbol)

An area where the surface layer has an electrical conductivity of 8 mmhos/cm more than the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has an electrical conductivity of 2 mmhos/cm or less.

Sand

As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone

Sedimentary rock containing dominantly sand-sized particles.

Sandy spot (map symbol)

A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils in the surrounding map unit is very fine sandy loam or finer.

Sapric soil material (muck)

The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat)

The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as "Ksat." Terms describing saturated hydraulic conductivity are:

Very high: 100 or more micrometers per second (14.17 or more inches per hour)

High: 10 to 100 micrometers per second (1.417 to 14.17 inches per hour)

Moderately high: 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour)

Moderately low: 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour)

Low: 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour)

Very low: Less than 0.01 micrometer per second (less than 0.001417 inch per hour).

To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation

Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification

The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock

A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum

A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil

A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol)

An area where, on the average, 75 percent or more of the original surface layer has been lost because of accelerated erosion. Not used in map units in which “severely eroded,” “very severely eroded,” or “gullied” is part of the map unit name.

Shale

Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion

The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope (map symbol)

A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.

Shoulder

The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell

The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune

A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology)

A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica

A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio

The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt

As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone

An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils

Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol)

A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Site index

A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic)

Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slide or slip (map symbol)

A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces.

Slope

The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope alluvium

Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill

The slow filling of ponds, resulting from restricted water transmission in the soil.

Slow water movement

Restricted downward movement of water through the soil. See Saturated hydraulic conductivity.

Sodic (alkali) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodic spot (map symbol)

An area where the surface layer has a sodium adsorption ratio that is at least 10 more than that of the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has a sodium adsorption ratio of 5 or less.

Sodicity

The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight: Less than 13:1

Moderate: 13-30:1

Strong: More than 30:1

Sodium adsorption ratio (SAR)

A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock

Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil

A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates

Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand: 2.0 to 1.0

Coarse sand: 1.0 to 0.5

Medium sand: 0.5 to 0.25

Fine sand: 0.25 to 0.10

Very fine sand: 0.10 to 0.05

Silt: 0.05 to 0.002

Clay: Less than 0.002

Solum

The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol)

A pile of earthy materials, either smoothed or uneven, resulting from human activity.

Stone line

In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones

Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony

Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot (map symbol)

A spot where 0.01 to 0.1 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surrounding soil has no surface stones.

Strath terrace

A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace

One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping

Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil

The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:

Platy: Flat and laminated
Prismatic: Vertically elongated and having flat tops
Columnar: Vertically elongated and having rounded tops
Angular blocky: Having faces that intersect at sharp angles (planes)
Subangular blocky: Having subrounded and planar faces (no sharp angles)
Granular: Small structural units with curved or very irregular faces

Structureless soil horizons are defined as follows:

Single grained: Entirely noncoherent (each grain by itself), as in loose sand
Massive: Occurring as a coherent mass

Stubble mulch

Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil

Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling

Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum

The part of the soil below the solum.

Subsurface layer

Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow

The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit

The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer

The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil

The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus

Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts

Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine

An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation)

An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology)

A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes

Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil

The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer

Otherwise suitable soil material that is too thin for the specified use.

Till

Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain

An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil

The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope

The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil

The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements

Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread

The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Tuff

A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.

Upland

An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill

The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation

Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve

A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very stony spot (map symbol)

A spot where 0.1 to 3.0 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surface of the surrounding soil is covered by less than 0.01 percent stones.

Water bars

Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering

All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded

Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wet spot (map symbol)

A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit.

Wilting point (or permanent wilting point)

The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow

The uprooting and tipping over of trees by the wind.

LOCATION GIELOW CA

Established Series
Rev: MJL/RFH/ET
03/2001

GIELOW SERIES

The Gielow series consists of deep, somewhat poorly drained soils formed in alluvium from sedimentary rocks. Gielow soils are on alluvial plains and fans and have slopes from 0 to 5 percent. The mean annual precipitation is about 44 inches and the mean annual temperature is about 56 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, mesic Cumulic Endoaquolls

TYPICAL PEDON: Gielow sandy loam - on a 2 percent slope in a grape vineyard at 590 feet elevation. (Colors are for dry soil unless otherwise stated. When described June 30, 1981, the soil was dry throughout.)

Ap1--0 to 4 inches; brown (10YR 5/3) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse subangular blocky structure parting to moderate very fine and fine subangular blocky; slightly hard, friable, nonsticky and nonplastic; many very fine roots; common very fine and fine and few coarse tubular pores; 5 percent 2 to 10 mm pebbles; moderately acid (pH 6.0); clear wavy boundary. (0 to 6 inches)

Ap2--4 to 8 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; moderate coarse and very coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine and common fine roots; common fine through coarse tubular pores; 5 percent 2 to 10 mm pebbles; moderately acid (pH 6.0); clear wavy boundary. (3 to 10 inches)

A1--8 to 11 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; moderate very coarse subangular blocky structure parting to moderate coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine and coarse roots; common fine through coarse tubular pores; 5 percent 2 to 10 mm pebbles; moderately acid (pH 6.0); clear wavy boundary. (3 to 10 inches)

A2--11 to 18 inches; brown (10YR 5/3) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate coarse and very coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and coarse and few medium roots; common very fine and fine and few coarse tubular pores; 5 percent 2 to 10 mm pebbles; moderately acid (pH 6.0); gradual wavy boundary. (7 to 10 inches)

BAt--18 to 37 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; common fine distinct mottles of brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine and fine roots; common very fine and fine and few medium tubular pores; few thin and moderately thick clay films on peds and in pores; 5 percent 2 to 10 mm pebbles; slightly acid (pH 6.2); gradual wavy boundary. (11 to 20 inches)

Btg-37 to 48 inches; light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; common fine distinct mottles of brown (7.5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; common very fine through coarse tubular pores; common moderately thick clay films in pores; 5 percent 2 to 10 mm pebbles; neutral (pH 6.8); abrupt wavy boundary. (10 to 20 inches)

C--48 to 65 inches; light yellowish brown (2.5Y 6/4) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine through coarse tubular pores; 5 percent 2 to 10 mm pebbles; neutral (pH 7.0). (10 to 25 inches)

TYPE LOCATION: Mendocino County, California; 0.3 mile west of Eastside Road and 150 feet south of Gielow Lane, Talmage, California; 530,800 feet north and 1,669,400 feet east, Zone 2, California coordinate system, Yokayo Rancheria, Elledge Peak 7 1/2 minute Quadrangle.

RANGE IN CHARACTERISTICS: Gielow soils are more than 60 inches deep. Mean annual soil temperature is 55 to 59 degrees F. The soil between the depths of 8 and 21 inches is dry in all parts from July 1 to October 15 and is moist the rest of the year. The particle-size control section is 18 to 27 percent clay. Base saturation is more than 50 percent throughout the profile. Organic carbon decreases irregularly with depth. Mollic epipedon is 24 inches thick or more and has mottles in the lower part. Reaction is medium acid to neutral. Gravel fragment content is 0 to 10 percent throughout the profile.

The A horizon is 10YR 5/2 or 5/3. Moist colors are 10YR 2/1, 3/1, or 3/2. It is sandy loam or loam.

The BAt and Btg horizons are; 2.5Y 6/2, 6/3 or 6/4. Moist colors are 2.5Y 4/2 or 4/4. It is stratified loam, fine sandy loam, sandy loam, or sandy clay loam with 15 to 27 percent clay.

COMPETING SERIES: These are the Coland, Comfrey, Delft, Glencoe, James Canyon, Keddie, Kimmerling, Konner, McClave, Peoh, Romnell, Shandep and Wenas series. All these soils except McClure have a mean annual soil temperature of less than 54 degrees F. McClure soils lack Bt horizons.

GEOGRAPHIC SETTING: Gielow soils are on alluvial plains and fans. Slopes are 0 to 5 percent. Elevations are 500 to 1,750 feet. The soils are formed in alluvium from sedimentary rocks. The climate is subhumid with hot dry summers and cool moist winters. Mean annual precipitation is 32 to 55 inches. Mean annual temperature is 54 to 57 degrees F. Frost-free season is 175 to 250 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are Cole, Russian, Feliz and Talmage soils. All these soils are xeric and thermic.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained, very slow to slow runoff, moderate permeability.

USE AND VEGETATION: This soil is used for vineyards, orchards, hay and pasture, wildlife and watershed, and limited homesite developments. Natural vegetation is annual and perennial grasses and forbs, occasional sedges and scattered oaks.

DISTRIBUTION AND EXTENT: Northern coastal California. The soils are not extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Davis, California

SERIES ESTABLISHED: Mendocino County, California 1985.

REMARKS: The classification was updated in February 2001 using the Eighth Edition to Soil Taxonomy. This series was formerly classified as fine-loamy, mixed, mesic Cumulic Haplaquolls. Competing series were not checked at that time.

National Cooperative Soil Survey
U.S.A.

LOCATION FELIZ CA

Established Series
Rev. RFH-DJE-JJJ-ET
02/2003

FELIZ SERIES

The Feliz series consists of very deep, well drained soils on flood plains. These soils formed in alluvium derived from mixed sedimentary rocks and have slopes of 0 to 8 percent. Mean annual precipitation is about 37 inches and mean annual temperature is about 57 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, thermic Cumulic Haploxerolls

TYPICAL PEDON: Feliz loam - in an irrigated vineyard of 1 percent slope at 500 feet elevation. (Colors are for dry soil unless otherwise noted. When described July 13, 1977, the soil was dry to 20 inches and moist below.)

Ap--0 to 2 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine and fine interstitial pores; slightly acid (pH 6.1); abrupt smooth boundary.

A--2 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate coarse and very coarse subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine interstitial pores; 5 percent 2 to 15 mm pebbles; neutral (pH 7.0); abrupt wavy boundary.

AC--7 to 26 inches; dark grayish brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) moist; moderate medium and coarse subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine and fine roots; many very fine and common fine interstitial and few medium tubular pores; 5 percent 2 to 20 mm pebbles; slightly alkaline (pH 7.5); clear wavy boundary. (Combined thickness of the A horizon ranges from 20 to 46 inches)

C1--26 to 39 inches; dark grayish brown (10YR 4/2) clay loam, very dark gray (10YR 3/1) moist; moderate medium and coarse subangular blocky stricture; hard, friable, sticky and plastic; few very fine and fine roots; common very fine and fine interstitial pores; 3 percent 2 to 20 mm pebbles; slightly alkaline (pH 7.5); clear wavy boundary.

C2--39 to 55 inches; dark grayish brown (10YR 4/2) clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, sticky and plastic; few very fine and fine roots; common very fine and fine interstitial pores; 5 percent 2 to 20 mm pebbles; slightly alkaline (pH 7.5); gradual wavy boundary.

C3--55 to 62 inches; dark grayish brown (10YR 4/2) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common fine interstitial pores; 13 percent 2 to 75 mm pebbles; slightly alkaline (pH 7.5). (Combined thickness of the C horizons ranges from 15 to over 60 inches)

TYPE LOCATION: Mendocino county, California; south of Hopland on Mountain House Road 1,700 feet south of Feliz Creek Bridge, then 700b feet west of road, on south side of vineyard avenue; 4,850 feet north and 700 feet east of the southwest corner of section 30, T.13 N., R.11 W., M.D.B.M. in the Sanel Land Grant, Hopland 7 1/2 minutes Quadrangle.

RANGE IN CHARACTERISTICS: The thickness of the solum ranges from 20 to 46 inches. The soil is more than 60 inches deep. Where not irrigated, the soil is dry in all parts between the depths of 6 and 18 inches from June to October and is moist in all parts from December to May. It is moist in some part from October to June. Mean annual soil temperature varies from 59 to 62 degrees F and is less than 47 degrees F for 30 to 60 days in December and January. Rock fragment content ranges form 0 to 15 percent throughout the solum.

The A horizon is 10YR 4/2, 5/2 or 5/3. Moist color is 10YR 2/2, 3/2 or 3/3. It has 18 to 30 percent clay. Base saturation (sum) is 75 to 95 percent. Reaction is slightly acid through slightly alkaline.

The C horizon is 10YR 4/2, 4/3, 5/2, 5/3 or 6/3. Moist color is 10YR 3/1, 3/2, 3/3, 4/2 or 4/3. It is loam or clay loam with an average of 20 to 30 percent clay. Below 36 inches, some pedons have very gravelly loam, very gravelly clay loam or very gravelly sandy clay loam substrata. Reaction is neutral or slightly alkaline.

COMPETING SERIES: These are the Colpien (T CA), Marimel (CA) and Still (CA) series. Marimel soils have lime and mottles in the lower part of the control section. Still soils have moderately slow permeability and are dry for 120 days. Colpien soils are effervescent in some part of the series control section.

GEOGRAPHIC SETTING: Feliz soils are on flood plains and fans and have slopes of 0 to 8 percent. The soils formed in alluvium from sedimentary rocks. Elevations are 160 to 1,750 feet. The climate is subhumid with hot dry summers and cool moist winters. Mean annual precipitation ranges form 32 to 60 inches. Mean January temperature is 44 degrees F; mean July temperature is 72 degrees F; mean annual temperature varies from 54 to 59 degrees F. Frost-free period is 175 to 250 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Cole, Russian and Talmage soils. Cole soils are fine. Russian soils are coarse- loamy. Talmage soils are loamy-skeletal.

DRAINAGE AND PERMEABILITY: Well drained; slow to medium runoff; moderate permeability.

USE AND VEGETATION: Used for cropland growing walnuts, pears, prunes, grapes and irrigated pasture.

DISTRIBUTION AND EXTENT: Northern California in the valleys of the Coast Range. The soils are not extensive. MLRA is 14.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Davis, California

SERIES ESTABLISHED: Mendocino County, California, Eastern Part, 1985.

REMARKS: The activity class was added to the classification in February of 2003. Competing series were not checked at that time. - ET

Diagnostic horizons and features recognized in this pedon are:

Mollic epipedon: The zone from 0 to 26 inches (Ap, A, Ac)

National Cooperative Soil Survey
U.S.A.

LOCATION COLE CA

Established Series
Rev. DWS-JMK-DJE-ET-AEC
03/2018

COLE SERIES

The Cole series consists of very deep, somewhat poorly drained soils that formed in alluvium from mixed sources. Cole soils are on stream terraces, flood-plain steps, and alluvial fans with slopes of 0 to 5 percent. The mean annual precipitation is about 40 inches and the mean annual air temperature is about 60 degrees F.

TAXONOMIC CLASS: Fine, mixed, superactive, thermic Pachic Argixerolls

TYPICAL PEDON: Cole clay loam - on a 1 percent slope in an irrigated walnut orchard at 1,360 feet. (Colors are for dry soil unless otherwise noted. When described on April 28, 1976, the soil was slightly moist throughout).

Ap--0 to 6 inches (0 to 15 cm); grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure parting to strong fine and medium granular; hard, firm, sticky and plastic; common very fine, fine and medium roots; common fine and medium tubular pores; few worm casts; slightly acid (pH 6.5); abrupt smooth boundary. (6 to 15 inches thick)

BAt--6 to 13 inches (15 to 33 cm); grayish brown (10YR 5/2) clay loam, very dark gray (10YR 3/1) moist; moderate fine and medium subangular blocky structure parting to strong fine and medium granular; hard, firm, sticky and plastic; common very fine, fine and medium roots; many fine and medium tubular pores; common thin clay films on peds and in pores; few worm casts; slightly acid (pH 6.3); clear smooth boundary. (0 to 8 inches thick)

Bt1--13 to 35 inches (33 to 89 cm); gray (10YR 5/1) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse angular blocky structure; very hard, firm, sticky and plastic; common very fine, fine and medium roots; common very fine and fine and few medium tubular pores; many thin and common moderately thick clay films on peds and in pores; 2 percent gravel 5 to 15 mm in diameter; moderately alkaline (pH 8.0); clear wavy boundary. (10 to 22 inches thick)

Bt2--35 to 51 inches (89 to 130 cm); brownish yellow (10YR 6/6) clay loam, yellowish brown (10YR 5/4) moist; grayish brown (10YR 5/2) clay films on peds and in pores; dark grayish brown (10YR 4/2) moist; weak medium prismatic structure; hard, firm, sticky and plastic; common medium coarse and few fine roots; common very fine, fine and few medium tubular pores; many thin clay films bridging mineral grains and common moderately thick clay films on peds and in pores; moderately alkaline (pH 8.0); clear wavy boundary. (6 to 17 inches thick).

Bt3--51 to 62 inches (130 to 157 cm); variegated brown (10YR 5/3) and pale brown (10YR 6/3) clay loam, yellowish brown (10YR 5/4) moist; grayish brown (10YR 5/2) clay films; weak medium prismatic structure; hard, firm, sticky and plastic; common medium, coarse and few fine roots; many very fine, fine and common medium tubular pores; few thin and moderately thick clay films bridging mineral grains, on peds, and in pores; moderately alkaline (pH 8.0); clear smooth boundary. (0 to 15 inches thick)

Bt4--62 to 71 inches (157 to 180 cm); variegated brown (10YR 5/3) and pale brown (10YR 6/3) clay loam, yellowish brown (10YR 5/4) moist; grayish brown (10YR 5/2) clay films; weak medium prismatic structure; hard, firm, sticky and plastic; few fine and medium roots; common very fine, fine and few medium tubular pores; common thin clay films on peds, bridging mineral grains and in pores; 4 percent gravel 2 to 20 mm in diameter; moderately alkaline (pH 8.0).

TYPE LOCATION: Lake County, California; about 5 miles southeast of Lakeport, 75 feet northwest of the junction of Argonaut Road and Thomas Drive; NE1/4 NE1/4, section 8, T.13 N., R.9 W. 38 degrees 59 minutes 36.8 seconds North, 122 degrees 52 minutes 32.5 seconds West, NAD83

RANGE IN CHARACTERISTICS: The mean annual soil temperature is 59 to 65 degrees F, and the soil temperature usually is not below 47 degrees at any time. The soil between depths of 4 and 12 inches is usually dry from July 1 to October 1 and is moist in all parts from December 1 to April 30. The soils usually increase in alkalinity with increasing depth but are noncalcareous. The particle-size control section has 35 to 45 percent clay. Organic carbon is 1 to 5 percent to a depth of 20 to 35 inches. Gravel content ranges from 0 to 15 percent throughout.

The A horizon dry color is 10YR 3/2, 4/1, 4/2, 4/3, 5/1, 5/2, 5/3; 2.5Y 4/1, 4/2, 5/1 or 5/2. Moist colors are 10YR 2/1, 2/2, 3/1, 3/2, 3/3; or 2.5Y 3/2. It is loam, silt loam, clay loam, or silty clay loam and has granular or subangular blocky structure. It is slightly hard to very hard and is neutral to moderately acid. Some pedons have AB or BA horizons.

The upper Bt horizon dry color is 10YR 2/1, 2/2, 3/1, 3/2, 4/1, 4/2, 4/3, 5/1, 5/2, 5/3, 5/4, 6/3; 2.5Y 3/2, 4/2, 5/2 N 3/0, or N 4/0. Moist colors are 10YR 2/1, 2/2, 3/1, 3/2, 3/3, 4/1, 4/2, 4/3 4/4; 2.5Y 3/2, 4/2 or 5/2. In some pedons the lower part has dry colors of 10YR 6/2, 6/3, 6/4 or 6/6. Moist colors are 4/4, 5/3 or 5/4 and some also have mottles. It is silty clay loam, clay loam, silty clay or clay and averages 35 to 50 percent clay in the upper 20 inches. It is slightly acid to moderately alkaline.

The lower Bt horizon dry color has hues of 10YR, 2.5Y or 5Y and values 3 through 6 dry and 2 through 6 moist. Chroma is 1 through 3 dry and 2 through 4 moist. It is clay loam, clay loam, silty clay loam or clay and is mildly or moderately alkaline. Some pedons are underlain by gravel.

COMPETING SERIES: There are no other series in this family.

GEOGRAPHIC SETTING: Cole soils are on flood-plain steps, stream terraces and alluvial fans at elevations of 50 to 1,500 feet. Slopes are 0 to 5 percent. The soils formed in alluvium from mixed sources. The climate is subhumid with warm or hot dry summers and cool moist winters. Mean annual precipitation is 25 to 50 inches. Average January temperature is 55 to 61 degrees F. The frost-free period is 150 to 290 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Bale, Botella, Soquel, Clear Lake, Cortina, Pajaro, and Yolo soils. Clear Lake soils are clayey throughout and have intersecting slickensides. Cortina soils have an ochric epipedon and have a loamy-skeletal control section. Pajaro soils lack an argillic horizon, have a fine-loamy control section, and have an aquic moisture regime. Yolo soils have an ochric epipedon, lack an argillic horizon, and have a fine-silty control section.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow runoff; slow permeability. Many areas have been artificially drained or have drainage altered by gullying.

USE AND VEGETATION: Used mostly for production of orchards, vineyards, truck crops, and irrigated pasture. Uncultivated areas have oak-grass vegetation with some shrubs and forbs.

DISTRIBUTION AND EXTENT: North coastal counties, California. The soils are moderately extensive. MLRA is 14.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Davis, California

SERIES ESTABLISHED: Lake County, California. Clear Lake Area 1927.

REMARKS: The activity class was added to the classification in February of 2003. Competing series were not checked at that time. - ET

Diagnostic horizons and features recognized in this pedon are:

Mollic Pachic epipedon -- the zone from 0 to 35 inches (Ap, BAt, Bt1)

Argillic horizon -- the zone from 6 to 62 inches (BAt, Bt1, Bt2, Bt3)

Edits made after sdjr projects-AEC

National Cooperative Soil Survey
U.S.A.

LOCATION WOHLY CA

Established Series
Rev. CAR/CEJ/JJJ/ET
01/2023

WOHLY SERIES

The Wohly series consists of very deep, well drained soils that formed in residuum weathered from sandstone and shale. Wohly soils are on hills and mountains. Slopes range from 9 to 75 percent. The mean annual precipitation is about 1400 mm (55 inches) and the mean annual temperature is about 13 degrees C (55 degrees F).

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, mesic Ultic Haploxeralfs

TYPICAL PEDON: Wohly loam - on a southwest-facing complex slope of 48 percent under tanoak, live oak, black oak, madrone and Douglas-fir at 720 feet elevation. (Colors are for dry soil unless otherwise stated. When described on July 14, 1978, the soil was dry throughout.)

Oi--0 to 1 centimeter (0 to 0.5 inches); litter of tanoak, live oak and madrone.

A--1 to 11 centimeters (0.5 to 4.5 inches); pale brown (10YR 6/3) loam, dark yellowish brown (10YR 4/4) moist; weak medium and moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine and fine roots; common fine interstitial and tubular pores; slightly acid (pH 6.2); clear smooth boundary. (5 to 13 centimeters thick)

Bt1--11 to 26 centimeters (4.5 to 10.5 inches); variegated light yellowish brown (10YR 6/4) and strong brown (7.5YR 5/6) loam, brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few coarse and common very fine and fine roots; common fine interstitial and few medium tubular pores; few faint clay films lining pores; 5 percent gravel (2 to 7 mm); moderately acid (pH 5.8); clear wavy boundary. (5 to 20 centimeters thick)

Bt2--26 to 67 centimeters (10.5 to 26.5 inches); variegated very pale brown (10YR 7/4) and reddish yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; moderate medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few very fine and coarse, and common fine roots; common fine interstitial and few fine tubular pores; common distinct clay films on faces of peds and lining pores; 5 percent gravel (2 to 40 mm); 10 centimeter krotovina; strongly acid (pH 5.3); clear wavy boundary. (4 to 46 centimeters thick)

Bt3--67 to 80 centimeters (26.5 to 31.5 inches); very pale brown (10YR 7/4) gravelly clay loam, strong brown (7.5YR 5/6) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine and few coarse roots; few fine interstitial and tubular pores; common distinct clay films on faces of peds and lining pores; 15 percent gravel (5 to 75 mm); strongly acid (pH 5.4); abrupt irregular boundary. (8 to 25 centimeters thick)

Ct--80 to 153 centimeters (31.5 to 60.5 inches); fragmental paragravel; few fine through very coarse roots in cracks; common distinct clay films on paragravel faces; paralithic material with cracks closer than 10 centimeters apart; 95 percent weakly cemented paragravel (5 to 75 mm) strongly acid (pH 5.4).

TYPE LOCATION: Mendocino County, Western Part, California; about 1.1 miles west of Highway 128 on Mountain View Road, 75 feet south of road at fir stump; about 100 feet west of southeast corner of the southwest quarter of southeast quarter, section 3, T.13 N., R.14 W.; Boonville Southwest Quadrangle, WGS84 Decimal degrees 39.007686 latitude and
-123.2804147 longitude, 10T UTM 475721mE 4317667mN NAD 83.

RANGE IN CHARACTERISTICS:
Soil Moisture: The soil between depths of 15 to 43 centimeters is moist in all parts from November 1 to May 15 (moist for more than 180 days) and is dry in all parts from July 1 to October 1 (dry for 90 to 120 days) in most years. The soil has a xeric soil moisture regime.

Mean annual soil temperature: 12 to 15 degrees C and the difference between mean summer and mean winter soil temperature is 6 degrees C or more. The soils have a mesic temperature regime.

Depth to highly weathered bedrock and thickness of the A and Bt horizons is 50 to 100 centimeters.

The A horizon:
Value: 10YR, 7.5YR or 5YR
Hue: 5, 6 or 7; 3 or 4 moist
Chroma: 3 or 4 dry or moist
Rock fragments: 0 to 15 percent
Reaction: moderately acid to neutral

The Bt horizon:
Value: 10YR, 7.5YR or 5YR
Hue: 5 through 7 dry; 3 through 6 moist
Chroma: 4 through 8 dry; 4 through 6 moist
Texture of the fine earth: loam, sandy clay loam, or clay loam
Clay content: 25 to 35 percent
Rock fragments: 0 to 15 percent in the upper part and 15 to 35 percent in the lower part
Base saturation (sum of cations) averages: 40 to 75 percent
Reaction: strongly acid to neutral

The C horizon consists of highly fractured bedrock which is typically very weakly to moderately cemented sandstone. The texture is fragmental paragravel, 5 to 75 mm in size, and pararock fragments range from 90 to 95 percent. Reaction is strongly acid to neutral.

COMPETING SERIES: These are the Beal, Boardburn, Boomer, Casabonne, Cherryhill, Cle Elum, Cohasset, Crozier, Dalig, Fives, Fong, Fordcreek, Gunn, Hood, Latourell, Lettia, Norling, Para, Pishpishee, Rosehaven, Sanhedrin, Tigit, , Varelum and Wilkeson soils. Beal, Boardburn, Boomer, Casabonne, Cherryhill, Cohasset, Dalig, Fives, Fong, Fordcreek, Gunn, Hood, Latourell, Lettia, Para, Pishpishee, Rosehaven, Sanhedrin, and Varelum soils do not have highly fractured bedrock material within 100 centimeters. Cle Elum, Hood, Norling, and Tigit soils have mean annual soil temperatures of 8 to 12 degrees C. Crozier soils have a base saturation of less than 35 percent throughout the Bt horizon.

GEOGRAPHIC SETTING: The Wohly soils occur on the backslopes and summits of hills and mountains. Slopes are 9 to 75 percent. Elevations are 91 to 1220 meters. The soils are formed in residuum weathered from sandstone and mudstone. The climate is subhumid with hot dry summers and cool moist winters. Mean annual precipitation ranges from 89 to 1778 centimeters. Mean January temperature is about 9 degrees C; and mean July temperature is about 20 degrees C. The mean annual temperature is about 13 degrees C. The frost-free period is 150 to 290 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Casabonne and the Gube, Hopland, Ornbaun, and Zeni soils. Gube soils are clayey and have base saturations less than 35 percent. Hopland soils have base saturations (sum) that do not fall below 75 percent in the argillic horizon. Ornbaun soils are more than 100 centimeters deep. Ornbaun and Zeni soils have an isomesic soil temperature regime.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Well drained; surface runoff under bare soil conditions is medium through high; moderately high saturated hydraulic conductivity.

USE AND VEGETATION: This soil is used for limited timber production, firewood production, wildlife habitat and watershed. Vegetation consists of Douglas-fir, tanoak, interior live oak, black oak, Pacific madrone, manzanita and poison oak.

DISTRIBUTION AND EXTENT: Siskiyou-Trinity Area, MLRA 5. The series is not extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Davis, California

SERIES ESTABLISHED: Mendocino County, California, Eastern Part, 1985.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - the zone from the soil surface to about 11 centimeters (the O and A horizons).

Argillic horizon - the zone from about 11 to about 80 centimeters (the Bt1, Bt2, and Bt3 horizons).

Fractured bedrock material - the zone from about 80 to 153 centimeters.(Ct horizon)

Particle size control section - the zone from about 11 to 61 centimeters averages 30 percent clay and 23.5 percent fine sand or coarser (the Bt1 and Bt2 horizons).

When first described in 1978 the C horizon was described as highly fractured sandstone bedrock with fractures less than 1 mm wide and 5 to 75 mm apart that slakes in water. Further investigation determined the portion of this material that slaked in water was considered soil and the more resistant material paragravel. The activity class was added to the classification in March of 2003. Competing series were revised in 2006. - ET

ADDITIONAL DATA:

Keys to Soil Taxonomy, 12th edition.

National Cooperative Soil Survey
U.S.A.

LOCATION CASABONNE CA

Established Series
Rev. CAR-DJE-JJJ-ET
05/2011

CASABONNE SERIES

The Casabonne series consists of very deep, well drained soils formed in colluvium and residuum weathered from sandstone or shale. Casabonne soils are deep to lithic or paralithic material with spacing between cracks of less than 10 centimeters apart. Casabonne soils are on hills and mountains. Slopes range from 9 to 75 percent. The mean annual precipitation is about 1520 millimeters (60 inches) and the mean annual temperature is about 13 degrees C (55 degrees F).

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, mesic Ultic Haploxeralfs

TYPICAL PEDON: Casabonne gravelly loam - on a north-facing convex slope of 40 percent under Douglas-fir and tanoak at 575 meters (1,880 feet) elevation. (Colors are for dry soil unless otherwise stated. When described April 4, 1978, the soil was moist throughout.)

Oi--0 to 2 centimeters (0.0 to 1 inch); litter of Douglas-fir and tanoak leaves and twigs.

A1--2 to 10 centimeters (1 to 5 inches); brown (7.5YR 4/4) gravelly loam, dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium and coarse roots; many very fine tubular and interstitial pores; 20 percent gravel (2 to 50 millimeters); strongly acid (pH 5.4); clear wavy boundary. (5 to 15 centimeters thick)

A2--10 to 25 centimeters (5 to 12 inches); brown (7.5YR 4/4) gravelly loam, dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine, and few medium and coarse roots; many very fine tubular and interstitial pores; 25 percent gravel (2 to 50 millimeters); strongly acid (pH 5.4); gradual wavy boundary. (13 to 23 centimeters thick)

Bt1--25 to 69 centimeters (12 to 27 inches); brown (7.5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few very fine and fine and common medium and coarse roots; many very fine and few fine and medium tubular and interstitial pores; few faint clay films on faces of peds and lining pores; 10 percent gravel (2 to 50 millimeters); strongly acid (pH 5.2); gradual wavy boundary. (33 to 43 centimeters thick)

Bt2--69 to 94 centimeters (27 to 37 inches); brown (7.5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; weak fine and medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine, fine, medium and coarse roots; many very fine, and few fine, medium and coarse tubular and interstitial pores; common faint and distinct clay films on faces of peds and lining pores; 10 percent gravel (2 to 50 millimeters); strongly acid (pH 5.2); abrupt smooth boundary. (13 to 38 centimeters thick)

Bt3--94 to 127 centimeters (37 to 50 inches); reddish yellow (7.5YR 6/6) gravelly clay loam, brown (7.5YR

4/4) moist; moderate medium angular blocky structure; hard, firm, moderately sticky and moderately plastic; common medium and coarse roots; many very fine and fine tubular and interstitial pores; many distinct clay films on faces of peds and lining pores; 20 percent gravel (2 to 70 millimeters); strongly acid (pH 5.2); abrupt irregular boundary. (25 to 38 centimeters thick)

Ct--127 to 200 centimeters (50 to 79 inches); gravel; strongly cemented, fractured sandstone; fractures are 2.5 to 10 centimeters apart and less than 1 millimeters wide; common medium and coarse roots follow fractures; continuous distinct clay films on fracture faces.

TYPE LOCATION: Mendocino County, California; about 9.15 miles west on Fish Rock Road from its intersection with Highway 128 to a north-facing meadow, then downslope 35 yards; about 3,750 feet west and 2,500 feet south of the northeast corner, section 14, T.12 N., R.14 W.; USGS Ornbaun Valley NW Quadrangle.

RANGE IN CHARACTERISTICS:

Soil moisture: The soil between the depths of 20 and 51 centimeters (8 to 20 inches) is dry in all parts from July 1 to October 1 (dry for 90 to 120 days) and is moist in all parts from November 1 to May 15 (moist for more than 180 days) in most years. The soil is in a xeric soil moisture regime.

Soil temperature: 12 to 15 degrees C(54 to 59 degrees F). The difference between mean summer and mean winter soil temperature is more than 6 degrees C.
The soil has a mesic soil temperature regime.

The base saturation by sum of cations in the upper 75 cm of the argillic horizon ranges from 20 to 50 percent..

Depth to lithic or Paralithic material with fractures less than 10 centimeters apart: 100 to 150 centimeters

Particle size control section weighted average:
Percent clay: 27 to 35 percent
Rock fragments: 5 to 25 percent
Reaction: strongly to slightly acid

A horizon:
Hue: 5YR, 7.5YR or 10YR
Value: 4 through 7, 3 through 6 moist
Chroma: 3 through 6, dry or moist
Clay content: 15 to 27 percent
Rock fragments: 0 to 35 percent strongly cemented sandstone or shale gravel
Reaction: strongly to slightly acid

Upper Bt horizons:
Hue: 5YR or 7.5YR
Value: 5 through 7 dry, 3 through 6 moist
Chroma: 3 through 6, dry or moist
Texture of fine earth: clay loam, sandy clay loam
Clay content: 27 to 35 percent
Rock fragments: 0 to 35 percent strongly cemented mudstone or shale gravel
Reaction: strongly to slightly acid

Lower Bt horizons:
Hue: 5YR or 7.5YR
Value: 5 through 7 dry, 3 through 6 moist
Chroma: 3 through 6, dry or moist
Texture of fine earth: clay loam, sandy clay loam
Clay content: 27 to 40 percent
Rock fragments: 0 to 35 percent strongly cemented mudstone or shale gravel
Reaction: strongly to slightly acid

Ct horizon:
Texture: gravel
Rock Fragments: 90 to 95 percent strongly cemented mudstone or sandstone

COMPETING SERIES: These are the Beal (CA), Boardburn (CA), Boomer (CA), Cherryhill (CA), Cle Elum (WA), Cohasset (CA), Crozier (CA), Dalig (WA), Fives (OR), Fong (CA), Fordcreek (ID)), Gunn (WA), Hood (OR), Katykat, Latourell (OR), Lettia (OR), Norling (OR), Para (T WA), Pishpishee (T CA), Rosehaven (OR), Sanhedrin (CA), Tigit (WA), Varelum (WA), and Wohly (CA) series. Beal, Dalig, Gunn, Hood, Latourell, Pishpishee, and Rosehaven soils are very deep and do not have lithic material within 100 to 150 centimeters. Boardburn, Boomer, Cherryhill, Cohasset, Crozier, Fives, Fong, Fordcreek, Lettia, Norling, Para, and Tigit soils formed from igneous materials. Cle Elum soils have a paralithic contact at depths within 50 to 100 centimeters. Varelum soils have a paralithic contact at depths within 100 to 150 centimeters. Wohly soils have paralithic materials between 50 and 100 centimeters. Sanhedrin soils have a mean January temperature less than 7 degrees C.

GEOGRAPHIC SETTING: Casabonne soils occur on the backslopes and summits of hills and mountains. Slopes range from 9 to 75 percent. Elevations are 150 to 1220 meters (500 to 4,000 feet). The soils formed in colluvium and residuum weathered from sandstone or shale. The climate is subhumid with hot dry summers and cool moist winters. Mean annual precipitation is 900 to 2030 millimeters (35 to 80 inches). Mean January temperature is 9 degrees C (48 degrees F), mean July temperature is 20 degrees C (68 degrees F), mean annual temperature is 13 degrees C (55 degrees F). The frost-free period is 150 to 290 days. Occasional snowfall occurs above 2,500 feet.

GEOGRAPHICALLY ASSOCIATED SOILS: This is the competing Wohly soil and the Pardaloe and Woodin soils. Pardaloe and Woodin soils are loamy-skeletal. Wohly soils are moderately deep to paralithic material.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Well drained; surface runoff under bare soil conditions is medium to high; moderately high saturated hydraulic conductivity.

USE AND VEGETATION: This soil is used for timber production, wildlife habitat and watershed. Vegetation consists of Douglas-fir, tanoak, Pacific madrone, and western bracken fern.

DISTRIBUTION AND EXTENT: Siskiyou-Trinity Area, MLRA 5.. The series is moderately extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Davis, California

SERIES ESTABLISHED: Mendocino County, California, Eastern Part, 1985.

REMARKS: Type location was moved to Western Mendocino soil survey in 1988. The activity class was added to the classification in January of 2003. - ET

This soil was revised in February 2008 due to the presence of bedrock with cracks mostly closer together than 10 centimeters and coatings on the rock fragments. The soil lacks a lithic contact - ET.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon -- the zone from 0 to 25 centimeters (O and A horizons)

Argillic horizon -- the zone from 25 to 127 centimeters (Bt1, Bt2, Bt3)

ADDITIONAL DATA: NSSL Pedon S80CA-045-020 (Type Location)

Soil classified using Keys to Soil Taxonomy, 11th edition.

National Cooperative Soil Survey
U.S.A.

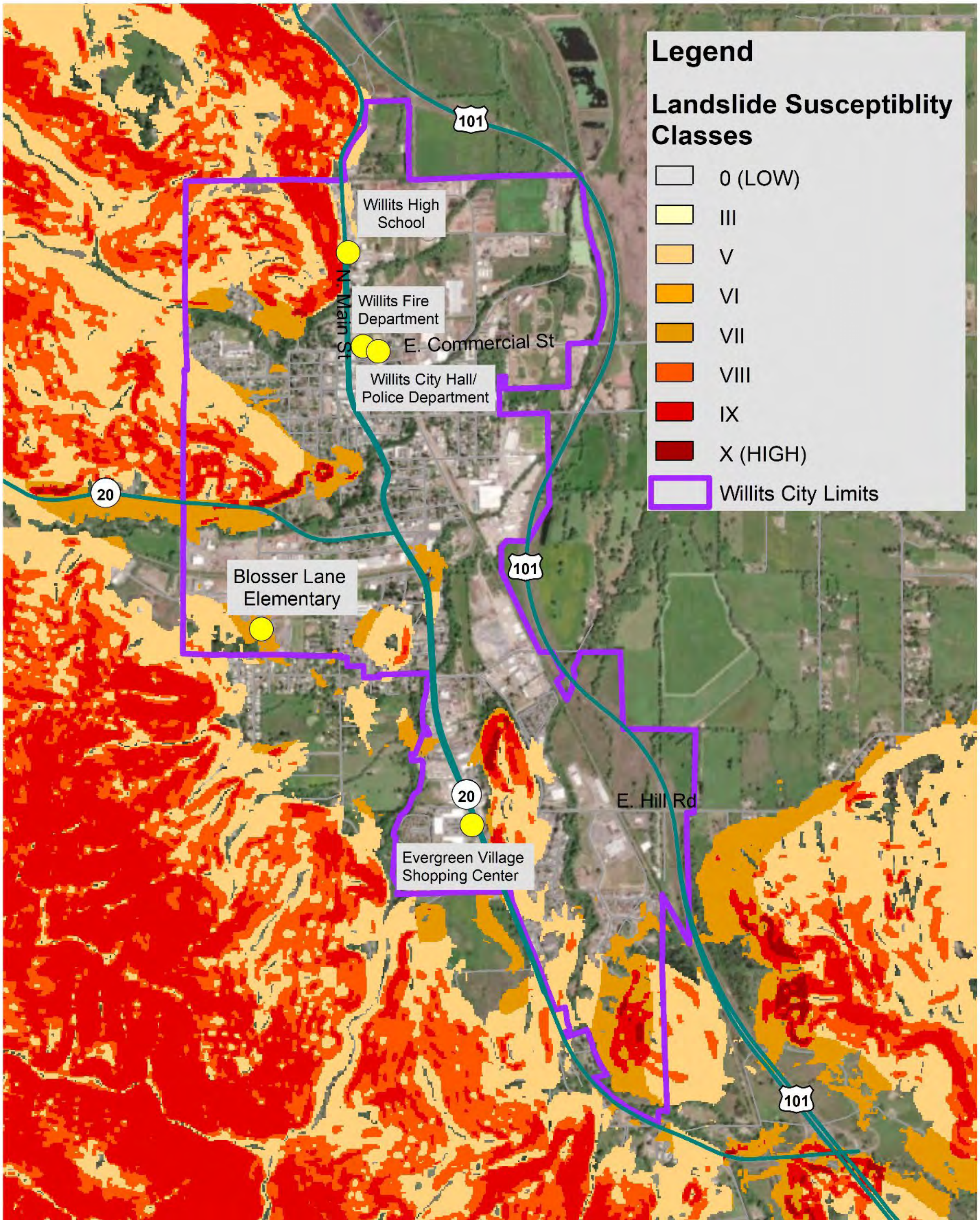

Figure S-3a Landslide Susceptibility Classes

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Seismic Hazards Program, California Geological Survey, California Department of Conservation

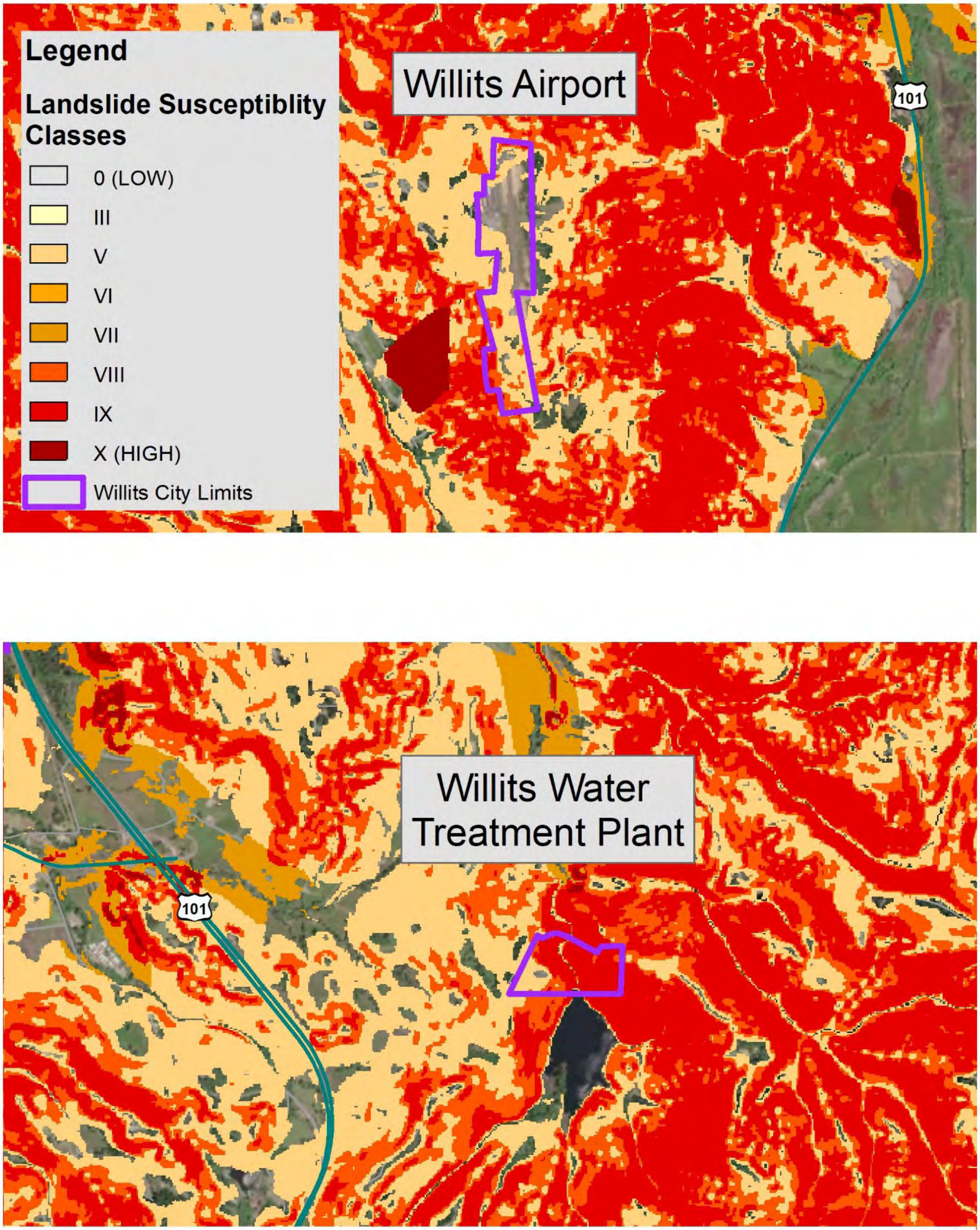

Figure S-3b Landslide Susceptibility Classes

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Seismic Hazards Program, California Geological Survey, California Department of Conservation

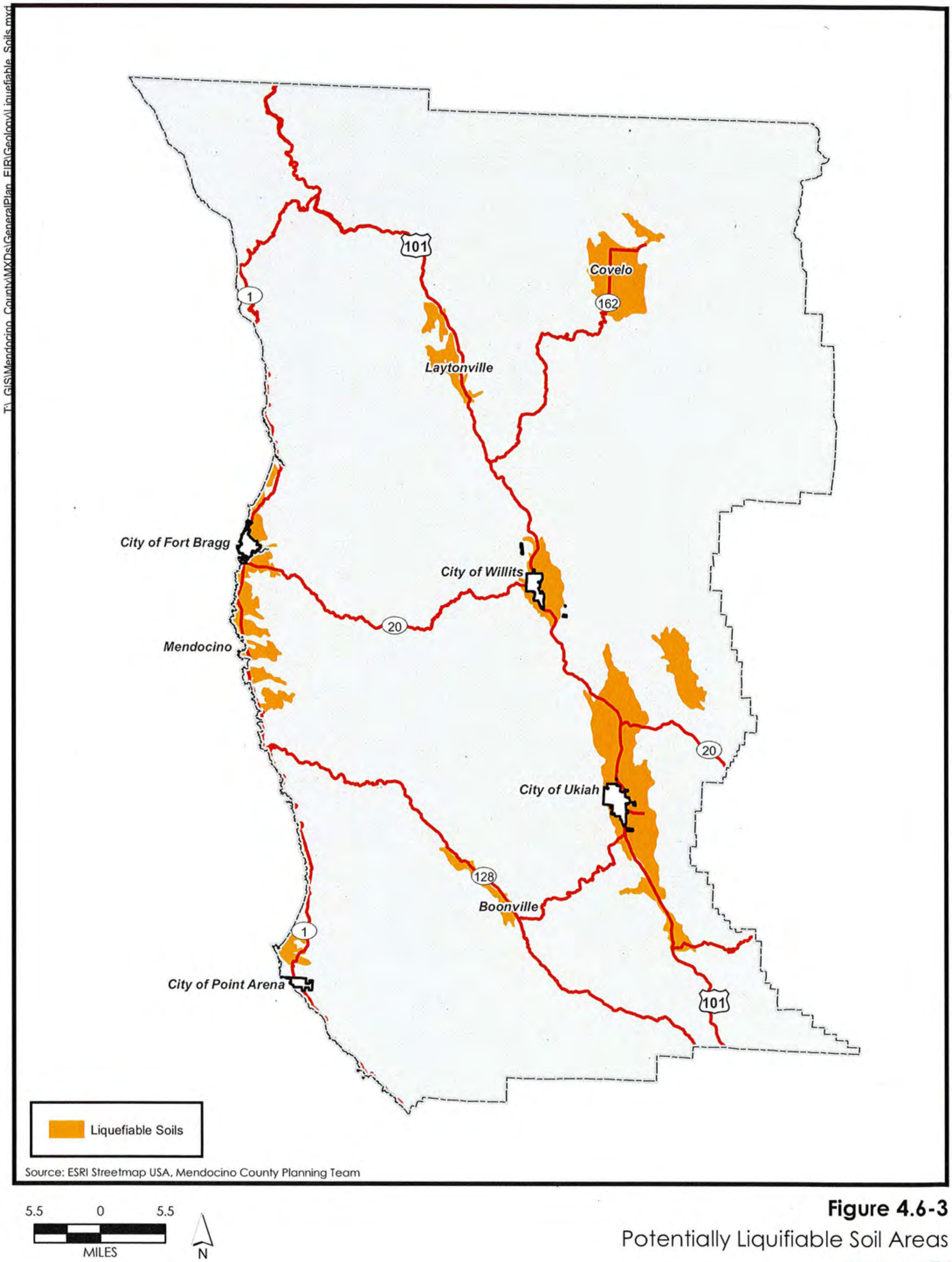

Figure 4.6-3
Potentially Liquifiable Soil Areas

PMC®

APPENDIX E - NOISE

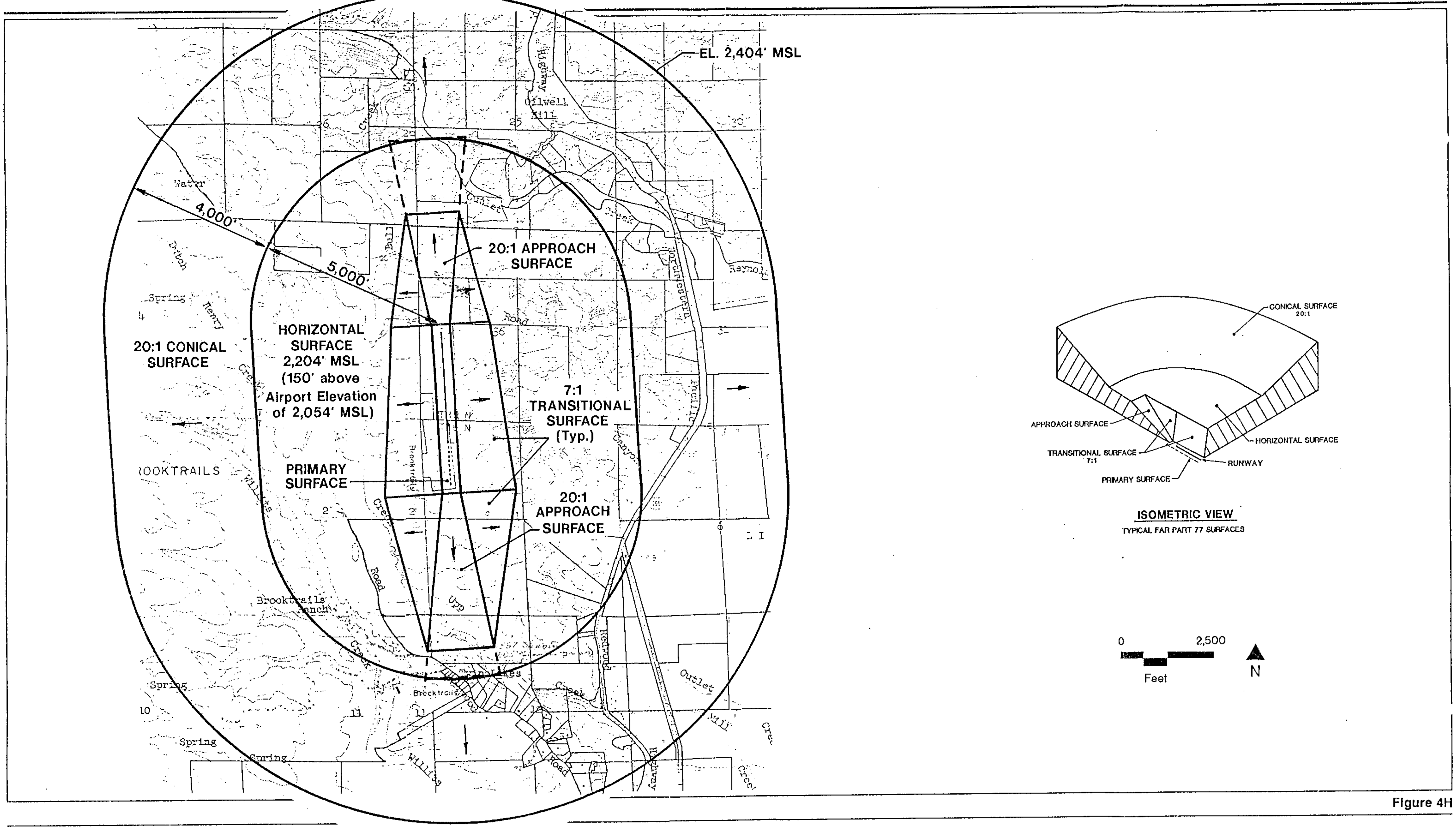

Figure 4H

Airspace Plan
Ells Field

APPENDIX F - INFRASTRUCTURE ASSESSMENT

LACO
SURVEYORS | ENGINEERS | PLANNERS | GEOLOGISTS
lacoassociates.com

September 22, 2023

7376.05

Planwest Partners Inc
1125 16th Street, Suite 200
Arcata, CA 95521

Attention: John Miller, Principal Planner

Subject: City of Willits Land Use Element Update Infrastructure Assessment
Water, Wastewater, Stormwater, Recycling & Solid Waste

Dear Mr. Miller:

LACO Associates (LACO) presents the City of Willits Land Use Element Update Infrastructure Assessment focused on Water; Wastewater; Stormwater; and Recycling & Solid Waste. We understand that Planwest Partners, Inc. (Planwest) will prepare an analysis related to Transportation; Parks & Recreation; Fire Services; and Police Services, if needed. We hope this provides useful information for use in the Land Use Element Update and associated environmental review.

Sincerely,
LACO Associates

Rod Wilburn, PE, JD, QSD
Principal Civil Engineer

Becky Dalske
Senior Planner & Project Manager

cc: Colette Santsche, AICP – Planwest, Principal Planner
Mike Nelson, AICP – LACO, President & CEO, Principal

City of Willits

Land Use Element Update Infrastructure Assessment

Water, Wastewater, Stormwater, Recycling & Solid Waste

September 22, 2023

Prepared for:
Planwest Partners, Inc.

Prepared By:
LACO Associates, Inc
1072 N. State Street
Ukiah, California 95482
707-462-0222

Project No. 7376.05

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Rod Wilburn, PE, JD, QSD

Becky Dalske, AICP

TABLE OF CONTENTS

Figures

Appendix 1

Land Use Element Update Existing Condition Report, LACO, 2023 *Water, Wastewater, Stormwater, Recycling & Solid Waste*

Appendix 2

Source and Storage Capacity Evaluation, State Water Resources Control Board, 2016

1.0 INTRODUCTION

The City of Willits (City) is amending its Land Use Element and Land Use Diagram (Land Use Element Update, or Project) for a 20-year planning period, or 2043. The City's General Plan, referred to as the Vision 2020 Willits General Plan Revision (Willits General Plan) was last comprehensively adopted in 1992. Since then, the City's land use needs have changed due to demographic and economic conditions and amendments are required to comply with State guidelines and policies.

A portion of the amendments are to apply Land Use Designations that best reflect the use and character of existing development within the City where the current Land Use Designation is not appropriate, whereas other amendments are intended to support residential and commercial development. As new development is only expected as a result of the amendments intended to support residential and commercial development, this Infrastructure Assessment will only evaluate this portion of the amendments, and not those intended to reflect the use and character of existing development. The City additionally proposes expansions to its Sphere of Influence (SOI) to allow the supply of land within the City to be expanded to accommodate potential future growth. The Cortese-Knox-Hertzberg (CKH) Local Government Reorganization Act of 2000 defines an SOI as a city's probable physical boundaries and service area as determined by the Local Agency Formation Commission (LAFCo). Designating lands as part of the SOI allows the City to plan for the eventual annexation and extension of services as part of community growth; and allows the City to designate uses compatible with adjacent City lands. The City's SOI is adopted, as required by State law, by the Mendocino LAFCo. The proposed land use amendments that are intended to support residential and commercial development (Land Use Change Areas) and the land that the City proposes to expand its SOI (SOI Area) are shown in Figure 1. These areas together are referred to as the Planning Area.

This Infrastructure Assessment looks at potential needs of development within the Land Use Change Areas and SOI Area on the City's water, wastewater, stormwater, and solid waste services, and whether the City would have sufficient capacity to provide these services to meet anticipated increases in demand due to the projected potential development. This Infrastructure Assessment utilizes and builds upon information from the Land Use Element Update Existing Conditions Report prepared by LACO in April 2023, which presented existing conditions about the City's utility systems (Appendix A), in addition to projected unit count estimates and the projected population for the planning period received from Planwest Partners (Planwest) in September 2023, and communication with Planwest and City staff.

2.0 LAND USE AND DEVELOPMENT PROJECTIONS

This section of the Infrastructure Assessment describes the Land Use designations that are included in the Land Use Change Ares and SOI Area and explains the assumptions used to estimate population and development projections that may occur due to development in the Land Use Change Areas and SOI Area and that are analyzed in this Infrastructure Assessment.

2.1 Land Use Designations

As discussed in Section 1.0, above, Land Use Change Areas include the Land Use Designation amendments that are intended to support residential and commercial development. Table 1 lists the areas proposed for amendments that would increase residential development, as of the date of this report.

Tabe 1. Land Use Change Areas

Location	Current Land Use Designation	Proposed Land Use Designation
North Main at Commercial Street	Commercial – General (C-G)	General Mixed Use (GM-U)
Goines, Matt East - Commercial Street	Commercial – General (C-G)	General Mixed Use (GM-U)
Former Hospital Site	Public Service (P-S)	Residential – Medium Density (R-M) and Commercial – General (C-G)
Baechtel Road	Industrial – General (M-G) and Commercial – General (C-G)	General Mixed Use (GM-U)
South Main Street Vacant Commercial	Commercial – General (C-G)	Residential – Medium Density (R-M)
South Haehl Creek Area	Residential – Suburban (R-S)	Residential – Medium Density (R-M) and Residential – Low Density (R-L)

Although the SOI Area is not included within City boundaries, land within this area has been assigned Land Use Designations consistent with the Land Use Element Update and the intended use of the land. Land Use Designations within the SOI Area include the following:

- Residential – Suburban
- Residential – Low Density
- Residential – Medium Density
- Commercial – General
- Industrial – General
- Public – Service

Land Use Designations proposed in the Land Use Change Areas and SOI Area are described in further detail in Table 2, below. As noted previously, Table 2 only includes Land Use Designations in the Land Use Change Areas that are intended to support residential and commercial development, and not those intended to reflect the use and character of existing development.

Table 2. Land Use Element Update – Land Use Designations

Land Use Designation	Description	Dwelling Units Per Acre	Floor Area Ratio
Residential – Suburban (R-S)	Intended to provide a transition from rural to urban areas where soils, topography, and site conditions are more appropriate for large lot residential uses.	Minimum: N/A Maximum: 0.5	N/A
Residential – Low Density (R-L)	Applied to areas where City services are available or planned and single family residential is the dominant use.	Minimum: N/A Maximum: 15	N/A
Residential – Medium Density (R-M)	Used where all urban services are available and close to services, recreation, schools, and employment and is suitable for mixed density residential uses allowing a variety of housing types.	Minimum: 15 Maximum: 30	N/A
General Mixed Use (GM-U)	Applied to specific areas within neighborhood and commercial centers where the existing or planned transportation alternatives, utilities, and services allow for mixed-use development that encourages	Minimum: 15 Maximum: 30	2.0

Land Use Designation	Description	Dwelling Units Per Acre	Floor Area Ratio
	walking, biking, and transit use. Allowable uses include retail, administrative office, general commercial, and a variety of housing types.		
Commercial – General (C-G)	Applied to areas that may serve as central business districts or address the needs of the travelers and visitors as a result of the location, access, site characteristics, or proximity to neighborhoods or travel routes.	Minimum: 15 Maximum: 30	2.0
Industrial – General (M-G)	Applied to sites that are best suited for a variety of industrial operations because of access, location, availability of power, water, sewer services and transportation facilities, and where their operations will be compatible with adjacent uses. Allowable uses may include office; research and development; heavy commercial; shipping, storage, and warehousing; a range of compatible industrial and manufacturing uses; and general agriculture.	Minimum: N/A Maximum: N/A	1.0
Public – Service (P-S)	Applied to public sites of schools, parks, civic centers, fairgrounds, airports, museums, libraries, auditoriums, utilities and infrastructure, corporation yards, hospitals, social service centers, and similar uses, and may be applied to investor-owned utility and quasi-public sites.	Minimum: N/A Maximum: N/A	N/A

2.2 Projected Population and Development

The following assumptions were used to generate projections for water usage, wastewater generation, stormwater, and waste disposal for this Infrastructure Assessment.

The Willits General Plan 1992 plans for a projected population of 7,500 persons. For the purposes of the Project, the City has determined to use 7,500 persons as the potential total City population at the end of the 20-year planning period, or 2043. This has been deemed to be an appropriate and conservative approach to projecting buildout population at the end of the 20-year planning period for purposes of the Project (Planwest, 2023). However, for the purposes of this Infrastructure Assessment, Planwest provided estimated unit counts that could potentially be developed within the Land Use Change Areas and SOI Area. These potential development projections would generate a greater population than the 7,500 persons considered as the projected population in the Project but would not be considered the maximum development potential of the Land Use Change Areas and SOI Areas. This is intended to provide the City with a high level understanding of the potential impact that development within the Land Use Areas and SOI Area may have on City infrastructure and relevant studies and analysis that would need to occur, should development facilitate a population greater than that currently planned for (7,500 people).

This Infrastructure Assessment assumes the Land Use Change Areas may facilitate approximately 976 residential units, while the SOI Area may facilitate approximately 880 residential units (Planwest, 2023). Based on the assumption that an average of 2.35 people occupy a unit within the City, the Land Use Change Areas may yield a potential of up to 2,294 additional people, while the SOI Area would yield up to 2,068 additional people (Planwest, 2023). These assumptions are summarized in Table 3, below.

Table 3. Assumptions for Potential Residential Development

Land Use Type	New Potential Units	People Per Unit	Total Potential Residents
Land Use Change Areas	976	2.35	2,294
SOI Area	880	2.35	2,068
Total	**1,856**		**4,362**

*Total Potential Residents = (New Potential Units) * (People Per Unit)*

No additional development other than residential units is anticipated within the Land Use Change Areas. For this report, development projections for commercial and industrial land in the SOI Area are based on the estimated area that may be developed and the estimated number of employees that would occupy new development. Projections are not calculated based on the maximum area that could be developed, as there is existing development within commercial and industrial areas of the SOI Area and these areas have topographical constraints that prevent portions of each property from being developed. The information that would have been necessary to determine how much of these areas are buildable was unavailable, and assuming the entirety of commercial and industrial parcels would be developed would result in an over-estimation. Instead, this Infrastructure Assessment assumes that each parcel of commercial and industrial land would be developed with one (1) building and would require one (1) new utility connection.

Within the SOI Area, two (2) parcels are proposed to have a C-G land use designation and 14 are proposed to have a M-G land use designation. As such, for the purposes of this analysis, it is assumed that the SOI Area would facilitate two (2) commercial utility connections and 14 industrial utility connections. Based on the average size of commercial and industrial buildings for sale in the City of Willits and County of Mendocino at the time of the writing of this report, is assumed that a commercial building would be approximately 5,200 square feet (sq ft) and an industrial building would be approximately 4,500 sq ft. Based on these assumptions, the SOI Area may result in an additional 10,400 sq ft of commercial development and 63,000 sq ft of industrial development. Based on the standards in Table 1004.1.2 of the 2016 California Building Code, it is assumed that one (1) occupant would occupy 100 sq ft of commercial and industrial areas. This would equate to an estimated 104 employees would occupy the hypothetical commercial development and 630 employees would occupy the hypothetical industrial development within the SOI Area. Although a portion of the SOI Area is designated Public Service, this area is already developed and would not be expected to increase population or development within the SOI Area. These assumptions are summarized in Table 4, below.

Table 4. Assumptions for Potential Non-Residential Development (SOI Area Only)

Land Use Type	New Potential Units	Size of Unit (sq ft)	Total Developed Area (sq ft)	Employees Per Unit	Total Potential Employees
Commercial	2	5,200 [1]	10,400	52	104
Industrial	14	4,500 [1]	63,000	45	630
Public Service	-	-	-	-	-
Total			**73,400**		**734**

*Total Potential Employees = (New Potential Units) * (Size of Unit) / (100 sq ft/person)*

[1] *The size of a commercial and industrial building was assumed by averaging the size of commercial and industrial buildings for sale in the City of Willits and County of Mendocino at the time of the preparation of this Infrastructure Assessment.*

Based on the population estimates of 4,362 persons for residential uses and 734 persons for commercial and industrial uses, as provided Tables 3 and 4, this report analyzes utility needs for a population increase of 5,096 persons. Assuming the City's current population is 5,008 persons (LACO, 2023), development analyzed in this report would lead to a population of approximately 10,104 persons. This development potential is highly speculative, and an overestimation of development anticipated within the planning period. These are the unit count and population projections utilized for this Infrastructure Assessment. If the proposed land uses or allowed density per land use designation were to be changed, the Planning Area may be able to theoretically accommodate additional units; however, this is outside the scope of this report. This Infrastructure Assessment does not analyze buildout of all allocated land use within the City and its proposed SOI, because based upon foreseeable population trends, buildout to a population greater than 7,500 is highly speculative and is not projected to occur within the next 100 years.

3.0 WATER

3.1 Existing Conditions

As discussed in the Existing Conditions Report (Appendix A), the City produced an average of 282.6 million gallons [867 acre feet (AF)] per year from 2019 to 2022. Between the Centennial Reservoir (638 AF) and Morris Reservoir (662 AF), the City has a total surface water storage capacity of approximately 1,300 AF. The City's current State Water Resource Control Board (SWRCB) permit (Water System No, CA 2310004) estimates the City's groundwater source production at 131 million gallons (402 AF) per year (LACO, 2023). The City additionally has water rights for diversion from Davis Creek for municipal uses totaling 2,615 AF per year (City of Willits, 2023). Including the City's storage capacity from the reservoirs, groundwater source production, and the water rights for diversion from Davis Creek, the City has a total theoretical water supply of 4,317 AF per year. This is summarized in Table 5, below.

Table 5. Theoretical Water Supply

Water Source	Water Supply (AF per year)
Reservoirs	1,300
Groundwater	402
Davis Creek Water Right Diversion	2,615
Total Water Supply	**4,317 AF per year**

3.2 Projected Water Demand

As shown in Figure 2, portions of the SOI Area are already served by the City's water system through out-of-agency services (OAS) connections. As the entirety of the Land Use Change Areas are within the city limits, they are not included in Figure 2. This section of the Infrastructure Assessment calculates water usage projections for potential new development in the Land Use Change Areas and SOI Area that is anticipated to increase water usage.

Table 6, below, shows the projected water demand that would be generated by the assumed Land Use Change Areas and SOI Area in gallons per day (GPD). Table 6 includes assumptions on increases of residents and employees as described in Section 2.2 of this Infrastructure Assessment. Please note, Table 2-4 of the Existing Conditions Report (Appendix A) determines that the City's population-based water production is 156 gallons per person per day; however, this is a calculation of the City's total water usage in terms of the population within the city limits and is not a reflection of water usage per user per day, as a portion of the population served City water is served through OAS connections outside the city limits and water is used for non-residential purposes. As such, a water usage rate from Metcalf and Eddy (2016), and not the Existing Conditions Report, was used to calculate projected water usage.

Table 6. Projected Water Demand

Land Use Type	Potential Residents/Employees	Water Usage Rate (gallons/day/capita)	Total Projected Water Use (GPD)
Residential (Land Use Change Areas)	2,294	74.8 [1]	171,561
Residential (SOI Areas)	2,068	74.8 [1]	154,686
Commercial	104	40 [2]	4,160
Industrial	630	16.5 [3]	10,395
Public Service	-	-	-
Total	**5,096**		**340,830 GPD**

*Total Projected Water Use = (Potential Residents/Employees) * (Water Usage Rate)*

1 *Residential wastewater flow rate: 68 gallons/day/capita; assume 90 percent of water usage becomes wastewater (Metcalf and Eddy, 2016).*

2 *Commercial water usage rate: 40 gallons/day/capita (Metcalf and Eddy, 2016).*

3 *Industrial wastewater flow rate: 15 gallons/day/capita; assume 90 percent of water usage becomes wastewater (Metcalf and Eddy, 2016).*

As shown in Table 6, above, the assumed growth within the Land Use Change Areas and SOI Area are projected to require approximately 340,808 GPD (1.05 AF), or 124,394,920 gallons (381.8 AF) per year. With the City's current estimated production of an average of 867 AF of water per year, it is anticipated that the City would be required to produce approximately 1,248.8 AF per year with the development anticipated in the Land Use Change Areas and SOI Area. This would equate to approximately 29 percent of the City's theoretical total water supply (provided in Table 5). Therefore, it appears the City would have sufficient water supply to serve the City's current and projected water demand.

3.3 Water Storage Evaluation

The City's water system is comprised of seven (7) pressure zones, as shown in Figure 3. Table 7, below, summarizes the projected total number of connections in the City's water system, storage capacity of each pressure zone, and fire flow required within each pressure zone. New connections facilitated by the Project would be located in the Meadowbrook and Main pressure zones (Planwest, 2023). These potential new connections are based on the potential residential units and non-residential buildings that are assumed for the Land Use Change Areas and SOI Area, as described in Section 2.2 of this report. The existing number of connections, storage capacity, and required fire flow of each pressure zone is based on a Source and Storage Capacity Evaluation (Evaluation) that was prepared by the SWRCB for the City (2016, Appendix B). Required fire flow is not a cumulative calculation based on the number of connections in a pressure zone; instead, it is based on the required fire flow for the highest need of a single connection in a pressure zone. Therefore, as development that may occur in the Land Use Change Areas and SOI Area is not anticipated to exceed the highest need that currently exists within the Main and Meadowbrook pressure zones, it is assumed that the fire flow requirements determined by the SWRCB (2016) are still accurate.

Table 7. Connections, Storage Capacity, and Fire Flow by Pressure Zone

Pressure Zone	Location	Existing Connections	Potential New Connections	Total Connections	Storage Capacity (gallons)	Fire Flow Required (gallons)
East Hill	Between the Surface Water Treatment Plant and Haehl Creek	148	-	148	1,500,000	240,000
Bittenbender	Bittenbender Pressure Zone	15	-	15	1,600	-
Northbrook	Northbrook neighborhood	20	-	20	3,000	-
Berry Hill	Berry Hill	128	-	128	43,000	60,000
Meadowbrook	Locust Street	165	701	866	125,000	63,120
Redwood	Laurel Street	159	-	159	43,000	60,000
Main	Baechtel Road	1,815	1,171	2,986	3,000,000	29,800

Table 8, below, calculates the total storage required for each pressure zone within the City's water system and the required storage available in each pressure zone with potential development in the Land Use Change Areas and SOI Area. The SWRCB's Evaluation (2016) calculated total storage required in each pressure zone using the maximum average day production (MADP) and maximum peak day production (MPDP). The SWRCB considers the highest average daily production and highest peak day production from the previous ten (10) years to be the MADP and MPDP, respectively. This Infrastructure Assessment utilized the same methodology; however, as the SWRCB's Evaluation (2016) only contains water usage data from 2005 to 2014, Table 8 calculates the total storage required using the 2014 MADP, 366 gallons per day per connection (gpdc), and the 2013 MPDP, 617 gpdc (Appendix 2). Although data from 2015 to 2023 is unavailable, the 2014 MADP and 2013 MPDP are anticipated to be accurate, as the City's water usage requirements have decreased over the years due to more efficient water usage (City of Willits, 2023).

Table 8. Total Storage Required and Storage Availability by Pressure Zone

Pressure Zone	Total Storage Required With Fire Flow (gallons)	Total Storage Required Without Fire Flow (gallons)	Required Storage With Fire Flow	Required Storage Without Fire Flow
East Hill	316,997	76,997	473%	1,948%
Bittenbender	7,804	7,804	21%	21%
Northbrook	10,405	10,405	29%	29%
Berry Hill	126,592	66,592	34%	65%
Meadowbrook	513,657	450,537	24%	28%
Redwood	142,720	82,720	30%	52%
Main	1,783,267	1,553,467	168%	193%
Total Storage Required = (Fire Flow)+(MADP)(Total Connections)+(MPDP)*(Total Connections)*(0.25)*				

The SWRCB's Evaluation (2016) shows that there is deficient storage in the Bittenbender, Northbrook, Berry Hill, Meadowbrook, and Redwood pressure zones. As shown in Table 8, the Bittenbender, Northbrook, Berry Hill, Meadowbrook, and Redwood pressure zones still have deficient storage; however, the smaller storage tanks within those pressure zones receive water from the 3-million-gallon tank, which has adequate storage to meet the requirements for the entire City. As such, the City's current water storage is anticipated to be sufficient for development in the Land Use Change Areas and SOI Area.

3.4 City Standards and Development Criteria

Development that occurs within the Land Use Change Areas and SOI Area would be required to comply with the City's design standards related to water system infrastructure at the time development is proposed. The City's current standards for water system infrastructure are included in Sections 99 and A.2 of the 100% Draft City of Willits Design and Construction Standards (Updated 2011). This includes but is not limited to standards for materials, alignment, size, connections, and pressure for water system infrastructure such as water lines, valves, meters, hydrants, and backflow devices.

4.0 WASTEWATER

4.1 Existing Conditions

As discussed in the Existing Conditions Report (Appendix 1), the City contributes an average of 0.39 million gallons per day (MGD) of wastewater to the inflow of the City's wastewater treatment plant (WWTP), which is equivalent to 390,000 GPD. Additionally, the City's WWTP has a peak hydraulic capacity of 7.0 MGD (LACO, 2023), and a permitted treatment capacity of 1.13 MGD average dry weather flow (ADFW). ADFW capacity is best explained as the amount of raw wastewater that can be treated during the dry months when the wastewater constituents are at their highest concentrations. During the wet weather months, wastewater is diluted by rainfall and groundwater inflows and infiltration (I&I), and the treatment facility can process a higher average flow per day. Although the City's WWTP has a permitted treatment capacity of 1.13 MGD ADFW, the Brooktrails Township Community Service District has an exclusive right to dispose of 0.49 MGD of effluent, meaning the City currently only has rights to dispose of 0.64 MGD of effluent (Mendocino LAFCo, 2019). Additional limitations are imposed in the City's Waste Discharge Requirements and Master Recycling Permit (NPDES NO. CA0023060), which states the average monthly discharge cannot exceed 4.0 MGD (NCRWQCB, 2021).

4.2 Projected Wastewater Flow

As shown in Figure 2, portions of the SOI Area are already served by the City's wastewater system through out-of-agency services (OAS) connections. As the entirety of the Land Use Change Areas are within City limits, they are not included in Figure 2. This section of the Infrastructure Assessment calculates wastewater flow projections for new development assumed, for the purposes of this report, within the Land Use Change Areas and SOI Area that is anticipated to increase wastewater flow.

Table 9, below, shows the projected wastewater in GPD that would be generated by the Land Use Change Areas and SOI Area. Table 9 includes assumptions on increases of residents and employees as described in Section 2.0 of this Infrastructure Assessment.

Table 9. Projected Wastewater Flows

Land Use Type	Potential Residents/Employees	Wastewater Flow Rate (gallons/day/capita)	Total Projected Wastewater Flow (GPD)
Residential (Land Use Change Areas)	2,294	68 [1]	155,965
Residential (SOI Area)	2,068	68 [1]	140,624
Commercial	104	36 [2]	3,744
Industrial	630	15 [3]	9,450
Public Service	-	-	-
Total	**5,096**		**309,783 GPD**
*Total Projected Wastewater Flow = (Potential Residents/Employees) * (Wastewater Flow Rate)*			

[1] *Residential wastewater flow rate: 68 gallons/day/capita (Metcalf and Eddy, 2016).*

[2] *Commercial water usage rate: 40 gallons/day/capita; assume 90 percent of water usage becomes wastewater (Metcalf and Eddy, 2016).*

[3] *Industrial wastewater flow rate: 15 gallons/day/capita (Metcalf and Eddy, 2016).*

Table 9, above, shows that projected wastewater flow from development assumed within the Land Use Change Areas and SOI Area is anticipated to be approximately 309,783 GPD, or 0.31 MGD. With the City's current contribution of an average of 390,000 GPD, or 0.39 MGD of wastewater to the inflow of the City's WWTP, it is anticipated that the City would contribute a total of approximately 699,783 GPD, or 0.70 MGD, if the development analyzed in this report were to occur. As the City's share of the WWTP ADFW treatment capacity is 0.64 MGD, the City's would not have adequate capacity to provide wastewater services to the full development that was analyzed in this report.

To address the wastewater capacity issue, the following is a list of potential options the City could pursue to increase capacity:

1. Acquire rights to dispose of a greater portion of the WWTP's ADFW treatment capacity beyond the City's current share of 0.64 MGD.
2. Make improvements to increase the ADFW treatment capacity of the WWTP.
3. Perform an analysis to demonstrate whether the WWTP's ADFW treatment capacity is greater than the permitted treatment capacity of 1.13 MGD ADFW.

It is important to note that, for the purposes of the Project, the City has determined to use 7,500 persons as the potential total City population at the end of the 20-year planning period, or 2043, while this report analyzes utility needs for a population of 10,104 persons. See Section 2.2 of this report for additional discussion. As the City has rights to dispose of 0.64 MGD of wastewater and currently disposes an average of 0.39 MGD, the City currently has an available remaining capacity of 0.25 MGD. Assuming a person generates 68 gallons of wastewater per day and that 2.35 people occupy a residential unit in the City, the City would theoretically have the capacity to serve an additional 3,676 persons, or 1,564 residential units, before reaching its capacity of 0.64 MGD. With a starting population of 5,008 people (LACO, 2023), a population of approximately 8,684 persons could theoretically be served by the City's existing wastewater capacity. The City would need to analyze the impacts of individual projects at the time of development to determine whether the City has sufficient wastewater treatment capacity to serve the proposed development.

4.3 Topography

As discussed in the Existing Conditions Report (Appendix 1), the City's wastewater collection system consists of 22 miles of gravity-fed sewer mains. New development in the SOI Area may constrain the City's ability to convey wastewater by way of gravity depending on topography and may require the installation of sewer lift stations in some areas (LACO, 2023). As the projected development is currently in the conceptual phase, the necessity of sewer lift stations cannot be analyzed at this time; however, sewer lift stations would be installed, as needed, as development occurs.

4.4 City Standards and Development Criteria

Development that occurs within the Land Use Change Areas and SOI Area would be required to comply with the City's design standards related to sewer system infrastructure at that point in time. The City's current standards for sewer system infrastructure are included in Sections 71 and A.2 of the 100% Draft City of Willits Design and Construction Standards (Updated 2011). This includes but is not limited to standards for materials, alignment, size, accessibility, and slope for sewer system infrastructure such as sewer lines, manholes, and lift stations.

5.0 STORMWATER

5.1 Existing Conditions

As described in the Existing Conditions Report (Appendix A), the City's storm drain system consists of approximately 5.6 miles of storm drain lines as well as open channels and ditches. Localized flooding occurs every two (2) or three (3) years along East Commercial Street and East Valley Street, and is also typical for the Walnut Street area, which includes Highway 20, Manor Way, and Alder Lane at the south end of the City, and other areas adjacent to Broaddus, Baechtel, and Mill Creeks. The primary limiting factors for City storm drain facilities are undersized drainage facilities, overgrown and blocked stream channels, and the water surface elevation of receiving waters (LACO, 2023).

5.2 Projected Future Storm Drainage

As described in Section 2.2, above, the SOI Area would have the potential to result in the development of 880 residential units, approximately 10,400 sq ft of developed commercial area, and approximately 63,000 sq ft of developed industrial area. As the projected development is currently in the conceptual phase, the impact of development cannot be analyzed at this time.

Figure 4 shows flood zones mapped by the Federal Emergency Management Agency (FEMA) within the SOI Area. As the Land Use Change Areas are partially developed and are generally surrounded by existing development, they have been excluded from Figure 4. As shown on Figure 4, only a small portion of the SOI Area near the northeastern area of the City is within a FEMA flood zone. These areas within FEMA flood zones may require additional storm drainage facilities at the time of development, as they are more prone to flood events.

5.3 City Standards and Development Criteria

Although impacts of the projected development cannot be analyzed at this time, development that occurs within the SOI Area would be required to comply with the City's standards for storm drainage at that time.

The City's current standards relating to storm drainage are included in the 100% Draft City of Willits Design and Construction Standards (Updated 2011). This includes but is not limited to standards for materials, size, alignment, slope, and maintenance of storm drainage facilities, such as manholes, pipes, culverts, gutters, and channels.

6.0 RECYCLING AND SOLID WASTE

6.1 Existing Conditions

The California Department of Resources Recycling and Recovery (CalRecycle) provides solid waste disposal data for cities and counties in California. Table 10, below, shows the amount of solid waste disposed by the City in tons and by pounds per person per day annually from 2017 to 2021, the five (5) most recent years of available data. Table 10 also shows that the 5-year average for solid waste disposal in the City is 4,659.6 tons per year and that, on average, each person in the City disposes 5.08 pounds of solid waste per day (CalRecycle, 2021).

Table 10. Solid Waste Disposal

Year	Waste Disposed (tons/year)	Per Capita Disposal Rate (lbs/person/day)
2017	2,697	2.90
2018	3,884	4.20
2019	3,720	4.10
2020	6,404	6.90
2021	6,592	7.30
Average Total	**4,659.6 tons/year**	**5.08 pounds/person/day**

As described in the Existing Conditions Report (Appendix A), solid waste generated in the City is exported to the Potrero Hills Landfill. The Potrero Hills Landfill has a maximum capacity of 83,100,000 cubic yards, and is expected to remain operational until 2048. The Potrero Hills Landfill has a maximum permitted throughput of 4,330 tons per day [CalRecycle, 2019(a)].

6.2 Projected Future Recycling and Solid Waste

Table 11, below, shows the total projected solid waste disposal that would be generated by the Land Use Change Areas and SOI Area. Table 11 includes assumptions on population and development increase as described in Section 2.0 of this Infrastructure Assessment.

Table 11. Projected Solid Waste Disposal

Land Use Type	Potential Residents/Development	Solid Waste Disposal Rate	Total Projected Solid Waste Disposal (lbs/day)
Residential (Land Use Change Areas)	2,294 people	5.08 lbs/person/day [1]	11,652
Residential (SOI Area)	2,068 people	5.08 lbs/person/day [1]	10,505
Commercial	10,400 sq ft	13 lbs/1,000 sq ft/day [2]	135
Industrial	63,000 sq ft	5 lbs/1,000 sq ft/day [2]	315
Public Service	-	-	-
Total Projected Solid Waste Disposal			**22,607 (lbs/day)**
*Total Projected Solid Waste Disposal = (Potential Residents/Development) * (Solid Waste Disposal Rate)*			

1 Residential solid waste disposal rate: Table 10 of this Infrastructure Assessment. Data obtained from CalRecycle, 2021.

2 Commercial and industrial solid waste disposal rates: CalRecycle, 2019(b). As CalRecycle provides multiple waste generation rates for both commercial and industrial development, which are meant to be used for providing a general level of information for planning purposes, this Infrastructure Assessment utilized moderate waste generation rates.

As shown in Table 11, above, the Land Use Change Areas and SOI Area are projected to generate 22,607.13 lbs, or 11.3 tons, of solid waste per day. This is equivalent to 0.26 percent of the maximum permitted throughput of Potrero Hills Landfill.

6.3 City Standards and Development Criteria

Development that occurs within the Land Use Change Areas and SOI Area would be required to comply with the City's standards for solid waste at that time. The City's current standards for solid waste are in Chapter 8.08 of the City's Code of Ordinances, which prohibits accumulation of solid waste and establishes conditions that must be complied with to enter into a contract for solid waste collection and disposal with the City.

7.0 CONCLUSION

Based on assumptions described throughout this Infrastructure Assessment for population and development projections, the City has sufficient water supply and water storage capacity to serve potential development within the Land Use Change Areas and SOI Area. As development is proposed within the Land Use Change Areas and SOI Area, additional analysis of individual project impacts should be completed in order to determine whether the City has sufficient wastewater treatment capacity, storm drainage facilities, and solid waste disposal capacity, and the types of improvements to these, and water services, would be required to support the proposed development.

8.0 REFERENCES

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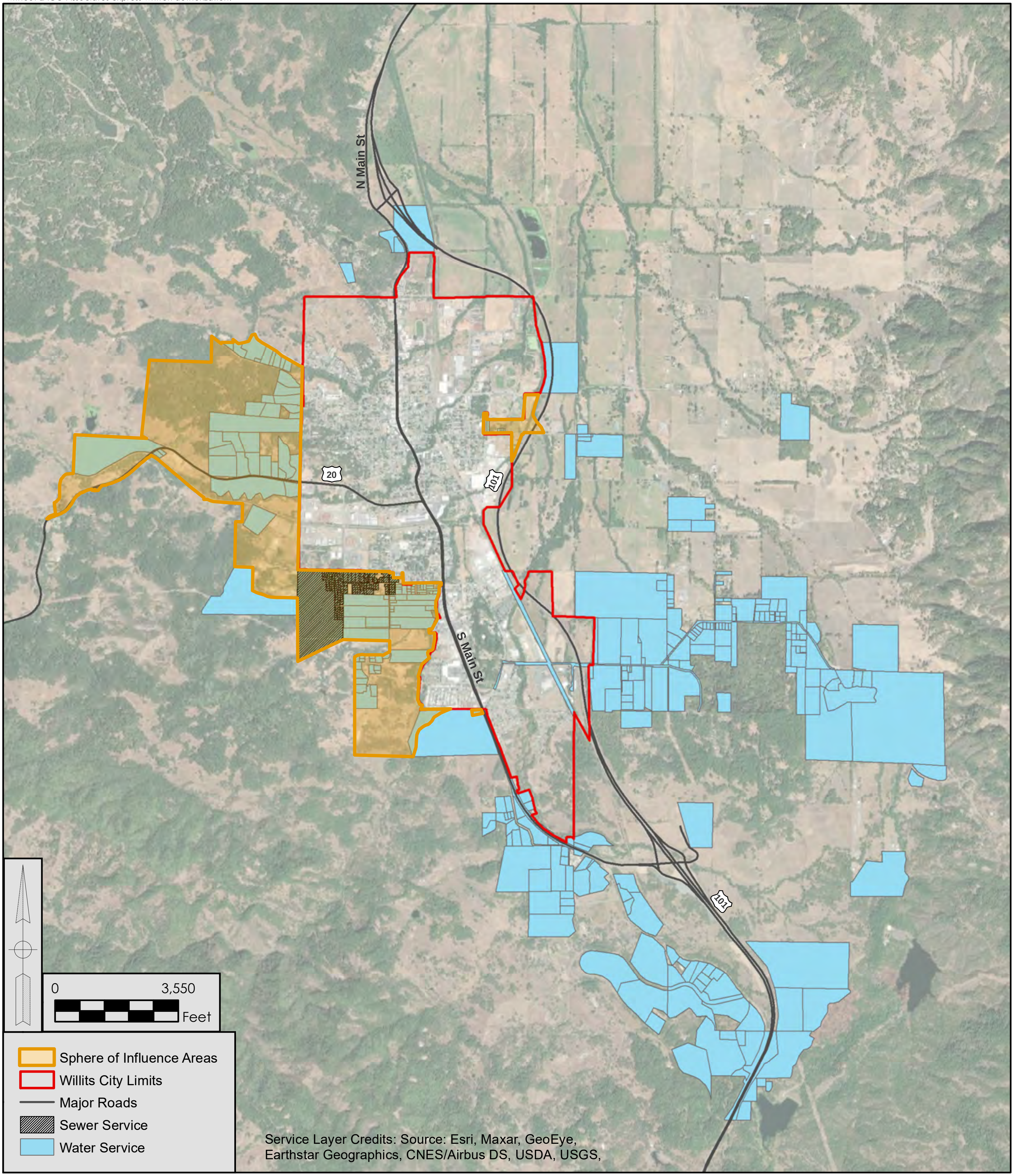
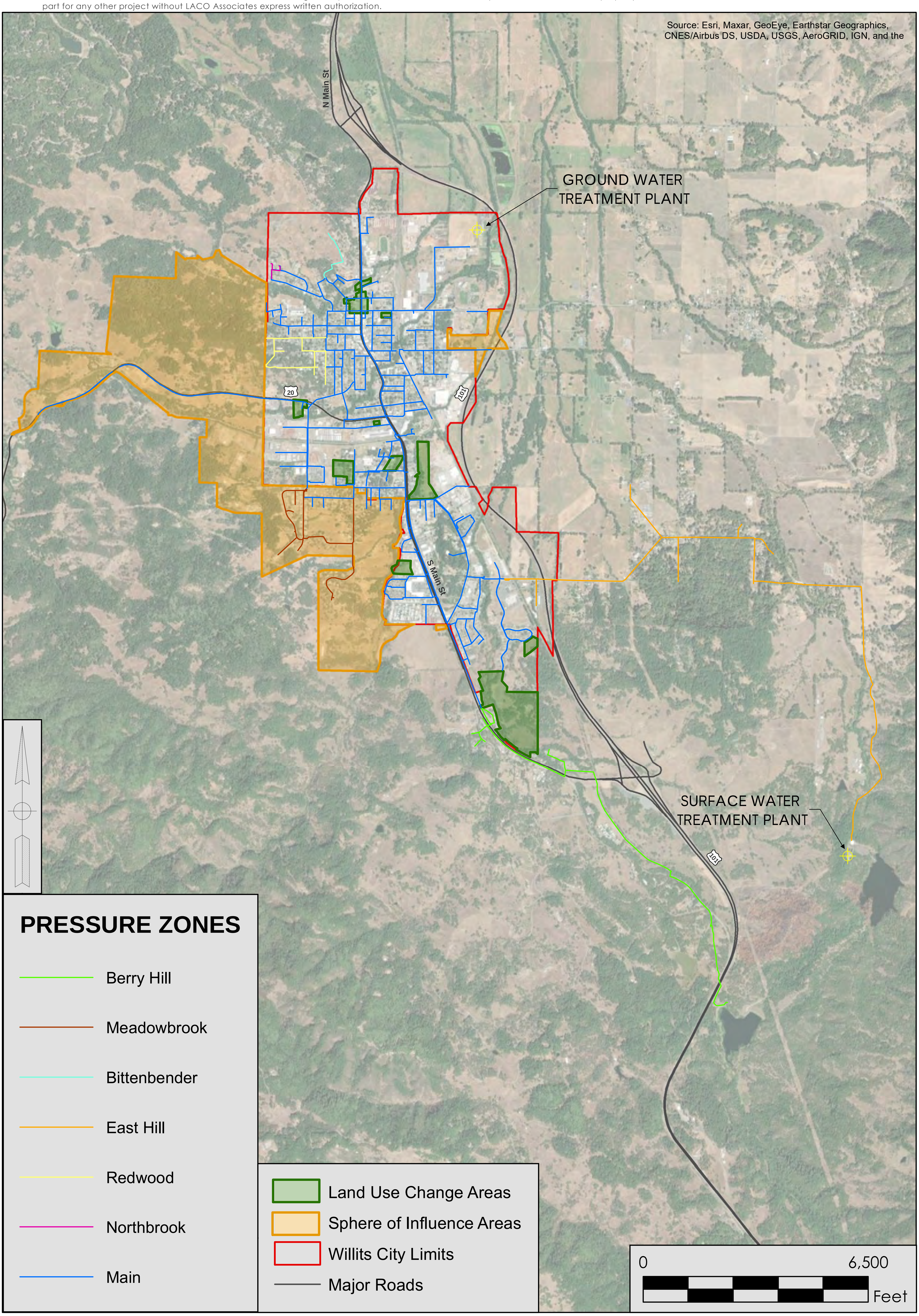
FIGURES

LACO EUREKA ● UKIAH ● SANTA ROSA 1-800-515-5054 www.lacoassociates.com	PROJECT Land Use Element UpdateInfrastructure Assessment	BY MCH/AM	FIGURE 2
	CLIENT City of Willits / Planwest Partners, Inc.	CHECK RMD	
	LOCATION Willits, California	DATE 09/12/2023	JOB NO. 7376.05
	Out-of-Service Area Overview Map		



LACO	PROJECT Land Use Element Update Infrastructure Assessment	BY JRG/MCH/AM	FIGURE 3
EUREKA • UKIAH • SANTA ROSA	CLIENT City of Willits / Planwest Partners, Inc.	CHECK RMD	
1-800-515-5054 www.lacoassociates.com	LOCATION Willits, California	DATE 09/22/2023	JOB NO. 7376.05
	Water Distribution System Overview		



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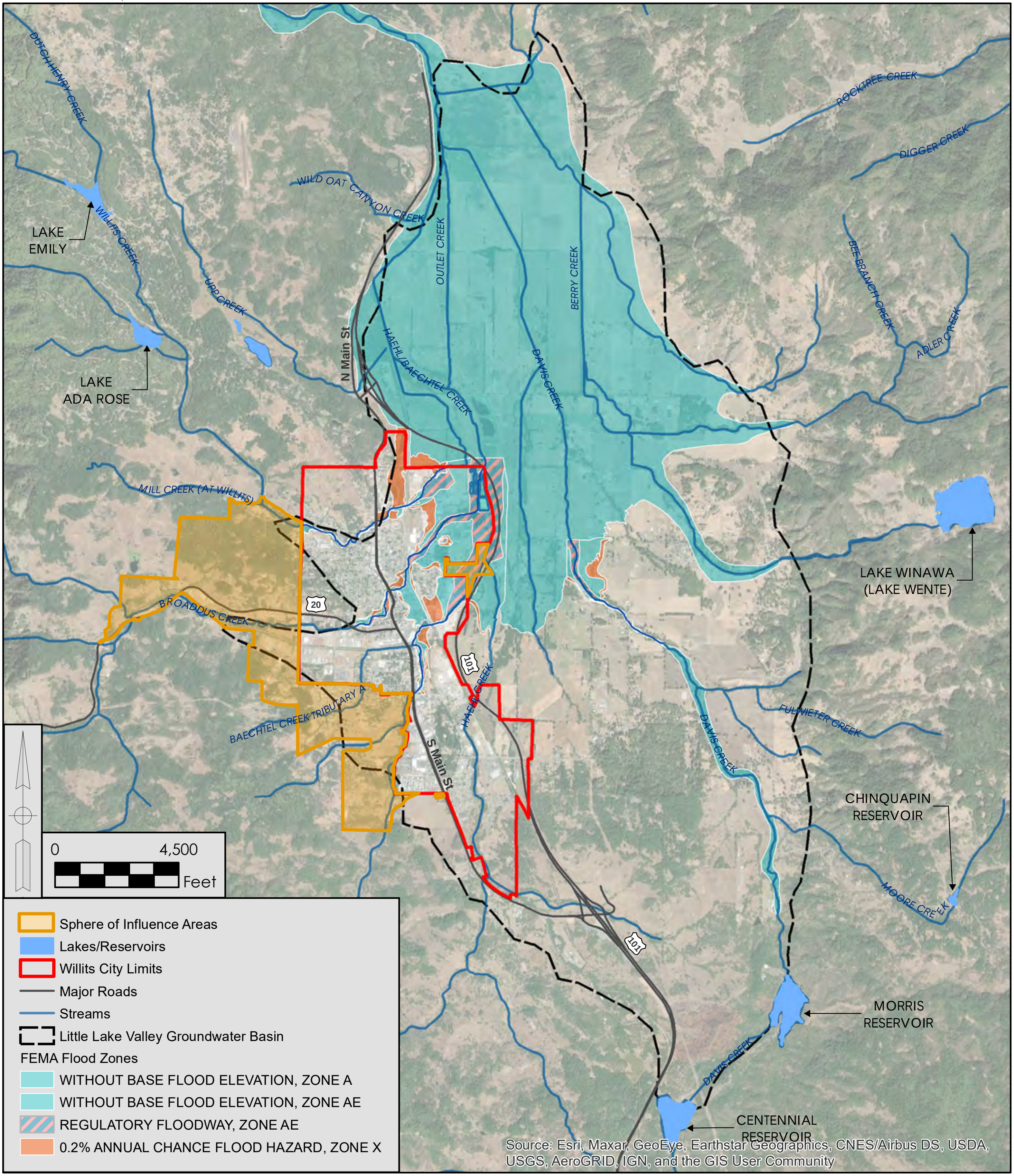
PROJECT	Land Use Element Update Infrastructure Assessment	BY JRG/MCH/AM	FIGURE 4
CLIENT	City of Willits / Planwest Partners, Inc.	CHECK RMD	
LOCATION	Willits, California	DATE 09/12/2023	JOB NO. 7376.05
	FEMA Flood Zone and Water Resources Map		



APPENDIX 1

Land Use Element Update Existing Condition Report, LACO, 2023

Water, Wastewater, Stormwater, Recycling & Solid Waste

LACO

April 19, 2023

7376.05

Planwest Partners Inc
1125 16th Street, Suite 200
Arcata, CA 95521

Attention: John Miller, Principal Planner

Subject: City of Willits Land Use Element Update Existing Conditions Report
Water, Wastewater, Stormwater, Recycling & Solid Waste

Dear Mr. Miller:

LACO Associates (LACO) presents the City of Willits Land Use Element Update Existing Conditions Report focused on Water; Wastewater; Stormwater; and Recycling & Solid Waste. We understand Planwest Partners, Inc. (Planwest) is preparing the following sections under separate cover: Transportation; Parks & Recreation; Fire Services; and Police Services. We hope this provides useful background information for use in the Land Use Element Update and associated environmental review.

Sincerely,
LACO Associates

Rod Wilburn, PE, JD, QSD
Principal Civil Engineer

Becky Dalske, AICP
Senior Planner & Project Manager

cc: Colette Santsche, AICP – Planwest, Principal Planner
Mike Nelson, AICP – LACO, President & CEO, Principal

City of Willits

Land Use Element Update Existing Conditions Report
Water, Wastewater, Stormwater, Recycling & Solid Waste

April 19, 2023

Prepared for:
Planwest Partners, Inc.

Prepared By:
LACO Associates, Inc
1072 N. State Street
Ukiah, California 95482
707-462-0222

Project No. 7376.05

LACO

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Rod Will

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Rebecca Dalska

Becky Dalske, AICP

TABLE OF CONTENTS

1.0 INTRODUCTION

This Existing Conditions Report (Report) presents existing conditions information about the current water, wastewater, stormwater, and recycling and solid waste services provided by the City of Willits (City). This Report is intended to serve as a reference document for the current efforts led by Planwest Partners, Inc. (Planwest) and the City of Willits (City) to prepare an updated Land Use Element of the City of Willits General Plan (adopted 1992). This Report provides background information to inform the Land Use Element Update, and a potential future City Sphere of Influence (SOI) amendment, and is based on readily-available public data and reports and discussions with City staff. This Report is limited in nature and is not a comprehensive assessment of the entirety of the City's water, wastewater, and stormwater systems nor the recycling and solid waste services provided by the City. No surveying, testing, or other field work has been completed as part of this Report. Additionally, a description of additional services such as transportation, parks and recreation, fire, and police is provided in a separate document prepared by Planwest.

2.0 CITY OF WILLITS WATER SYSTEM

The City owns, operates, and maintains a public water system that includes surface water reservoirs, a groundwater well, a surface water treatment plant (WTP), a groundwater treatment plant (GWTP), and associated distribution infrastructure. This section describes the existing conditions of the water supply, treatment, and distribution system.

2.1 Water Supply Sources

The primary potable water supply source for the City is surface water from the Centennial and Morris Reservoirs, with groundwater available as a back-up supply to be used in accordance with the City of Willits Groundwater Operational Use Plan (adopted 2022). These sources are described in further detail below. The City's water supply sources and water treatment plants, along with other public water purveyors in the surrounding area are shown on Figure 2-1, below.

2.1.1 Surface Water

The City historically obtained its entire potable water supply from surface water sources: the Centennial and Morris Reservoirs, both fed by Davis Creek. According to bathymetric surveys completed by the City in 2012, the Centennial Reservoir has a storage capacity of approximately 638 acre-feet (AF) and the Morris Reservoir has a storage capacity of approximately 662 AF, for a total of approximately 1,300 AF of surface reservoir storage. Due to limited storage capacity in these reservoirs, the system was (and largely still is) reliant on late rain in regions south of the City to keep reserves full late enough in the year that they will not be exhausted (LACO, 2019). Additionally, water availability in these reservoirs is contingent on numerous factors including but not limited to: losses to evapotranspiration; useable storage (when considering that when the volume of the reservoirs is depleted in the summer and fall months, the water warms, the amount of organic material present in the reservoirs increases, and it can be more difficult to treat); and release requirements for normal and drought years that are mandated by the City's water rights. An in-depth evaluation of these factors is outside the scope of this Report; however, consideration of these factors is important to understanding the various constraints on the City's water supply system.

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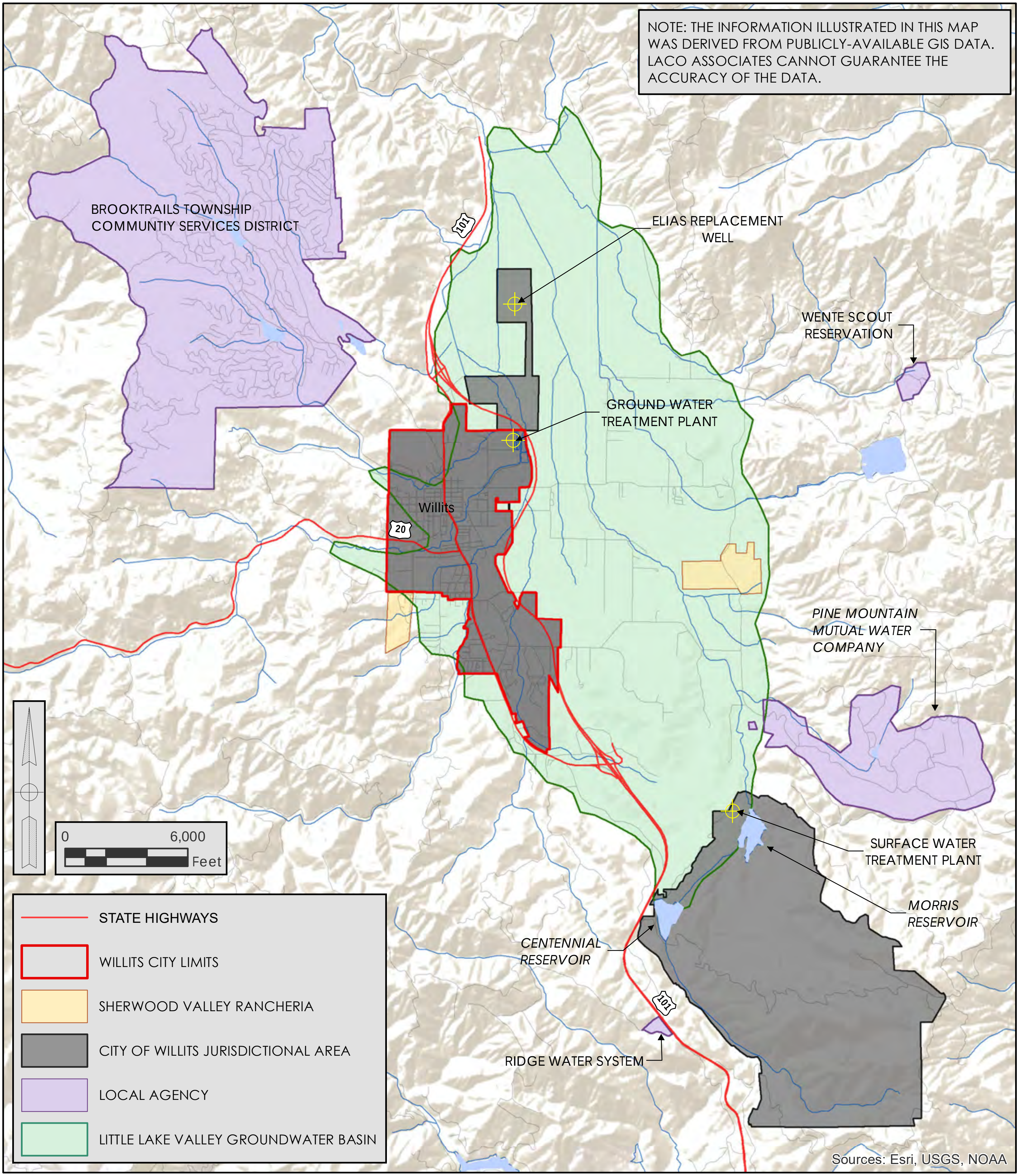
PROJECT Land Use Element Update Existing Conditions Report	BY JRG/MCH	FIGURE 2-1
CLIENT City of Willits/Planwest Partners, Inc.	CHECK RMD	
LOCATION Willits, California	DATE 03/29/2023	JOB NO. 7376.05
Water System Source and Local Agency Overview		



As provided in Table 2-1, below, from 2019 to 2022, the City produced an average of approximately 22.5 million gallons per month (MGM), for a total of approximately 270.5 million gallons (MG) per year, from surface water sources (Communications with City Staff, 2023).

Table 2-1. 2019-2022 average surface water production. Source: Communications with City Staff, 2023.

Month	Average Production (MGM)
January	18.1
February	17.2
March	20.1
April	21.4
May	22.6
June	26.1
July	30.1
August	29.6
September	26.6
October	22.7
November	18.3
December	17.7
Total (Avg./Month)	*22.5*
Total (Annual)	**270.5 million gallons**

Surface water is treated at the City's WTP located adjacent to the Morris Dam using alternative filtration technology, an upflow clarifier process, and disinfection with sodium hypochlorite (LAFCo, 2019). The WTP was upgraded in 2015 to include additional filters and tank liners, a new upflow solids contact clarifier, and approximately 3,400 feet of piping replacements (LAFCo, 2019). The WTP has a treatment capacity of 3.3 million gallons per day (MGD), 100 MGM, or 3,682 AF per year. This treatment capacity is much greater than the current average usage by the City. The treated water is first stored at a 1.5 MG chlorine contact tank and then conveyed by gravity through a 16-inch water main that runs down from Davis Creek, along East Side Road and East Hill Road to the primary 3 MG storage tank above Baechtel Road.

2.1.2 Groundwater

In response to the severe drought conditions from 2013 to 2014 that prompted declaration of a Stage 5 Water emergency, the City developed the Elias Replacement Well (ERW) and GWTP to supplement the surface water sources. The ERW is within the Little Lake Valley groundwater basin, is approximately 200 feet deep, and currently has a 30 horsepower (hp) pump that produces approximately 330 gallons per minute (GPM). The GWTP, which treats groundwater from the ERW, is located off Sewer Plant Road. The extracted groundwater is relatively high in manganese and iron. To address this, the GWTP utilizes filtration and chlorine addition to oxidize the manganese prior to filtration and to provide disinfection residual (LACO, 2019).

The ERW was put into service in late 2015 after being approved by the State Water Resources Control Board (SWRCB) Division of Drinking Water as a public water source for emergency use. In 2017, non-emergency use of this groundwater supply was approved by the SWRCB Division of Drinking Water and on August 9, 2017, the Willits City Council approved full-time use of the ERW to supplement the surface water supply (LAFCo, 2019). In 2022, the City implemented the City of Willits Groundwater Resiliency Improvement Project (Groundwater Project) in order to increase the transfer capacity from the ERW to the GWTP. The Groundwater Project included the upgrading 3,600 feet of pipe connecting the ERW to the GWTP from 6-inch Schedule 40

Polyvinyl Chloride (PVC) pipe to 10-inch high-density polyethylene (HDPE) pipe. In 2022, as part of the public hearing process for the Groundwater Project's environmental review, the Willits City Council approved managed use of the groundwater supply pursuant to a Groundwater Operational Use Plan. The Groundwater Operational Use Plan (City of Willits, 2022) allows for an average use of 8 MGM for domestic purposes, unless an emergency situation occurs, or regular operation and maintenance of the City's water system requires the City to use in excess of that amount, at which time Council would be apprised of the need for the increased amount. The City produced approximately 14.0 MG of groundwater in 2021 and 21.6 MG in 2022, as shown in Table 2-2, below (Communications with City Staff, 2023). In 2019, 13.6 MG of groundwater was produced; however, a monthly break down of the production at the GWTP was not available for 2019 so that data is not included in Table 2-2. Groundwater was not used in 2020.

Table 2-2. 2021 and 2022 average groundwater production. Source: Communications with City Staff, 2023.

Month	2021 Production (MGM)	2022 Production (MGM)
January	0	0
February	0	0
March	0	0
April	0	0
May	0	6.3
June	0	6.0
July	0	2.2
August	0	2.8
September	0	2.6
October	0	0
November	6.0	0
December	8.0	1.7
Total (Avg./Month)	1.2	*1.8*
Total (Annual)	**14.0 million gallons**	**21.6 million gallons**

2.1.3 Annual Water Production

In 2022, the City water system (including both the WTP and GWTP) produced approximately 299.1 MG (see Table 2-3, below, for a monthly breakdown of water produced by source). During this period, the City produced a total of 21.6 MG of groundwater, equating to approximately 7 percent of the City's total annual supply. These production totals are reported for 2022 only because of it being the first full year of system operation under the Groundwater Operational Use Plan (City of Willits, 2022).

Table 2-3. 2022 average water production by source. Source: Communications with City Staff, 2023.

Month	Total Production (MGM)	Surface Water Production (MGM)	Groundwater Production (MGM)	Groundwater Percentage
January	19.2	19.2	---	0%
February	18.5	18.5	---	0%
March	24.6	24.6	---	0%
April	24.2	24.2	---	0%
May	25.8	19.5	6.3	24%
June	27.7	21.7	6.0	22%
July	28.5	26.3	2.2	8%
August	30.3	27.5	2.8	9%

September	31.2	28.6	2.6	8%
October	25.5	25.5	---	0%
November	19.7	19.7	---	0%
December	23.9	22.2	1.7	7%
Total (Avg./Month)	*24.9*	*23.1*	*1.8*	*7%*
Total (Annual)	**299.1**	**277.5**	**21.6**	**7%**

The population-based water demand from 2019 to 2022 is shown in Table 2-4, below, using the amount of raw source water produced during a given year at both the WTP and GWTP. Please note, water losses in treatment and distribution were not deducted from these totals and groundwater was not produced in 2020.

Table 2-4. Population-based water production. Source: Communications with City Staff, 2023.

Year	Population	Total Water Produced (MG)	Total Water Produced (AF)	AF/Person/ Year	Gallons/Person/ Day
2019	4,890	283.0	868.5	0.18	159
2020	4,975	262.0	803.9	0.16	144
2021	4,969	286.4	878.8	0.18	158
2022	5,008	299.1	918	0.18	164
Average	**4,960.5**	**282.6**	**867.3**	**0.17**	**156**

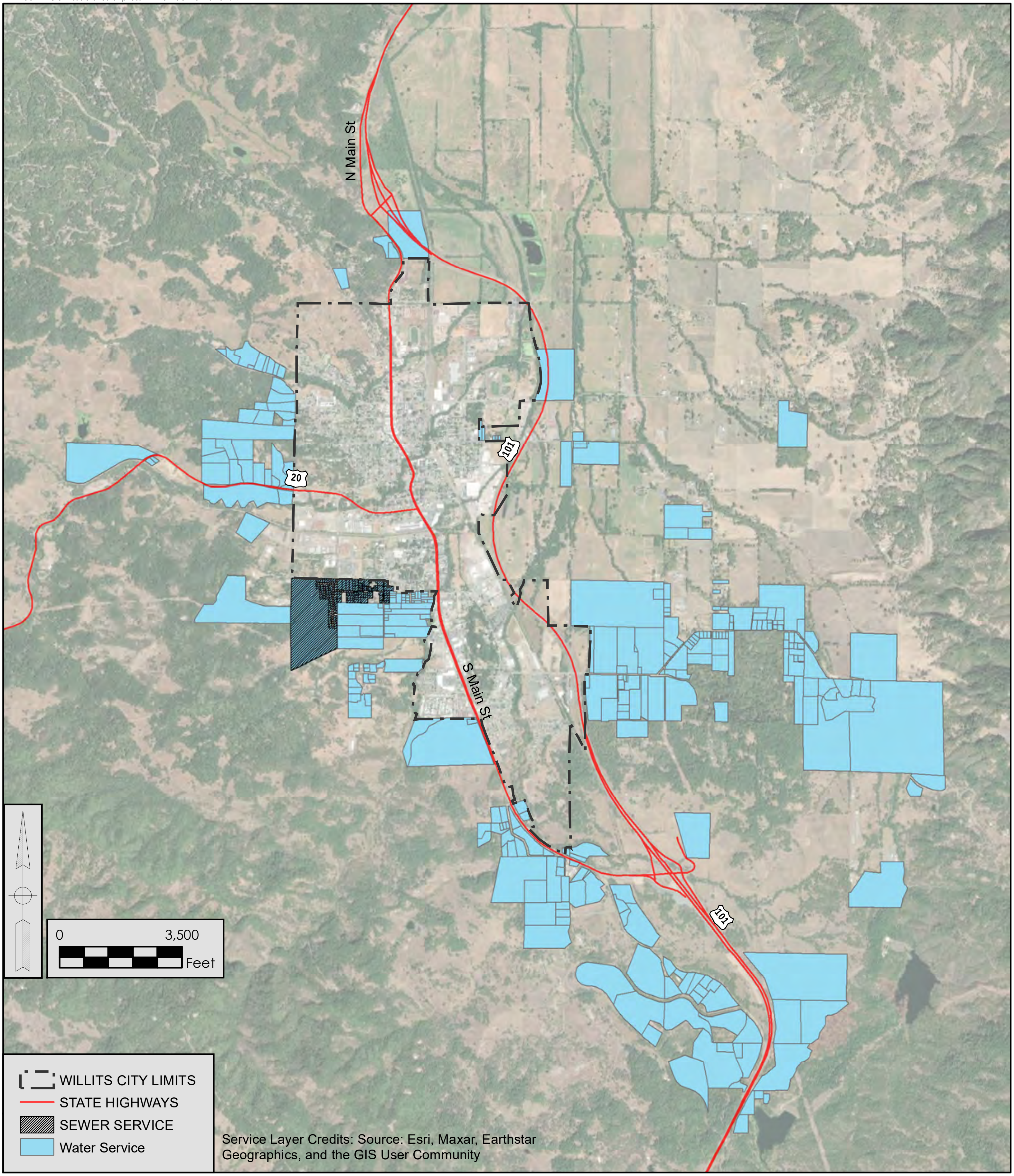
Peak water demand in the City occurs during the summer months (typically June to September) and based on data from 2021, exceeded 1.59 MGD on a day of highest use in August 2021 (Communications with City Staff, 2023). Water production data (source water used at the treatment facilities) can be used to determine peaking factors and is helpful in system sizing. Based on the Surface Water Treatment Plant Operations Guide prepared by Waterworks Engineers in April 2015, the peak summer flows for treatment plant are 1,200 to 1,400 GPM and based on review of historical data and discussions with the City staff, the average flow is approximately 540 GPM. The resulting peaking factor for source water required for production is 2.2 to 2.4.

Comparing water sold to water produced can also be helpful as it determines the water loss. Water loss can occur through several different modes, the most common of which is small leaks within the distribution lines. According to the data provided by the City, it is not possible to separate losses at the WTP and GWTP for backwash of the filters. The backwash water is discharged to ponds at the WTP and the GWTP discharges to the equalization basins at the wastewater treatment plant (WWTP). Based on data provided by the City, there is an average of approximately 28,000 gallons of water lost per day at the treatment facilities for backwash and within the distribution system. A more detailed review of the City's measurement of water produced at the treatment facilities and measurement of water metered at the water service connections is warranted to better understand the overall condition of the water distribution system.

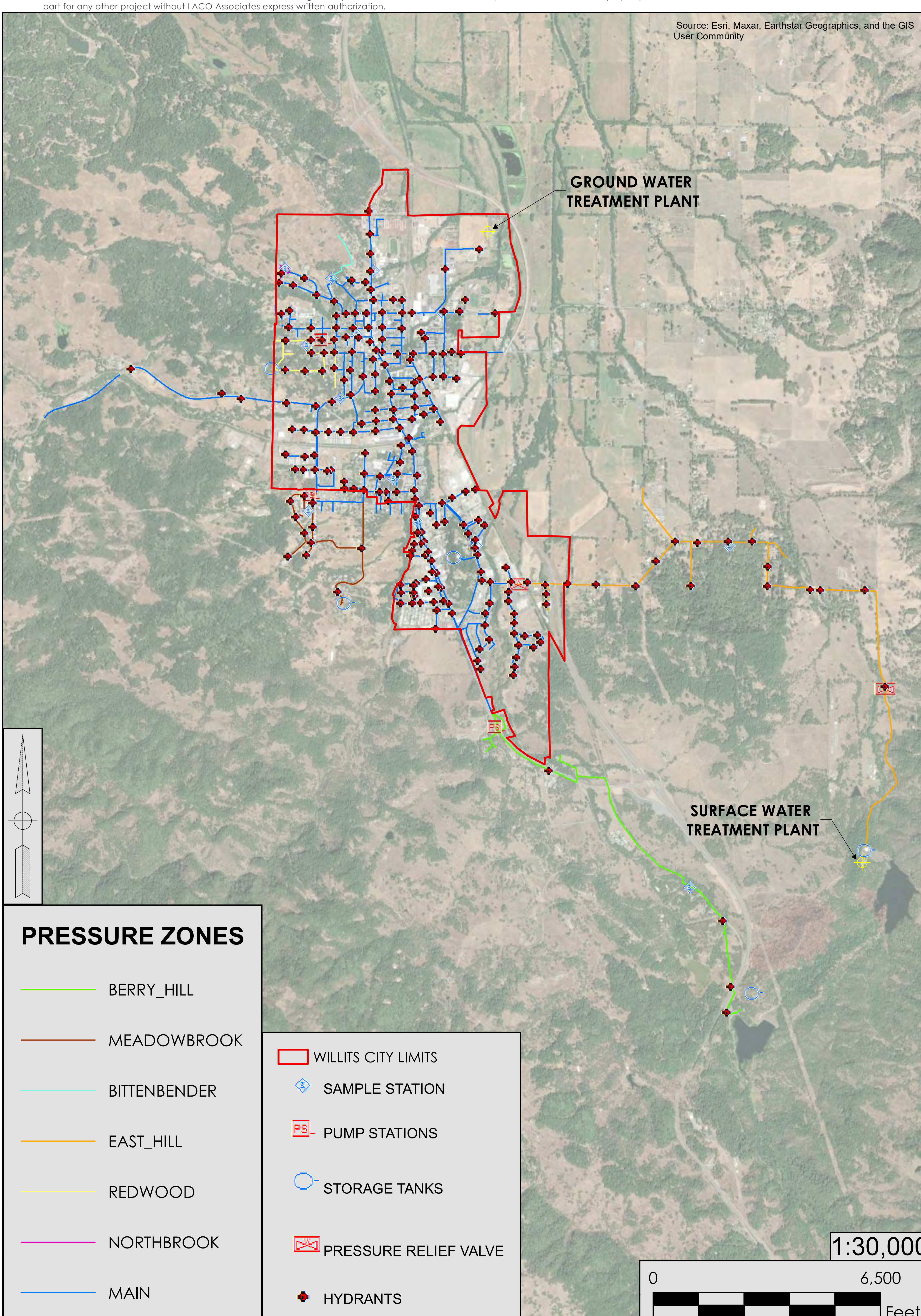
2.2 Water System Service Area and Infrastructure

The City water system service area includes the incorporated City and certain surrounding areas, serving a population of 5,500 to 6,600 people (LACO, 2019). This population is served through a total of 2,412 connections, including 1,909 single-family residential (SFR) connections, 503 non-SFR/non-fire protection connections, and 55 fire connections that provide fire protection for commercial and industrial buildings (City of Willits, 2023a). This includes 437 out-of-agency services (OAS) connections outside the City limits (see Figure 2-2, below). Figure 2-3, below, provides an overview of the City's distribution system, including the OAS connections. These OAS connections serve individual homeowners and groups of homeowners from master

LACO	PROJECT	Land Use Element Update Existing Conditions Report	BY	MCH	FIGURE 2-2
EUREKA • UKIAH • SANTA ROSA	CLIENT	City of Willits / Planwest Partners, Inc.	CHECK	RMD	
1-800-515-5054 www.lacoassociates.com	LOCATION	Willits, California	DATE	03/30/2023	JOB NO. 7376.05
		Out-of-Service Area Overview Map			



LACO	PROJECT	Land Use Element Update Existing Conditions Report	BY	JRG/MCH	FIGURE 2-3
EUREKA • UKIAH • SANTA ROSA	CLIENT	City of Willits / Planwest Partners, Inc.	CHECK	RMD	
1-800-515-5054 www.lacoassociates.com	LOCATION	Willits, California	DATE	03/30/2023	JOB NO. 7376.05
		Water Distribution System Overview			



meters located at the City limits. Pursuant to an agreement signed in November 1995, the City provides water and wastewater services to the Sherwood Valley Band of Pomo Indians Rancheria (Rancheria) located southwest of the City limits, which includes residential units, a community center, and the Sherwood Valley Casino. Through this agreement, the City provides for the water needs of up to 50 residential units, or functional equivalent (LAFCo, 2019).

As shown on Figure 2-3, the City water distribution system includes approximately 28 miles of transmission and distribution lines of various sizes, six (6) treated water storage tanks, three (3) pump stations, and 240 fire hydrants (Communications with City Staff, 2023). The City water distribution system is divided into seven (7) pressure zones: Berry Hill, Bittenbender, East Hill, Main, Meadowbrook, Northbrook, and Redwood. Treated water from the WTP is conveyed 2.5 miles to the distribution system via a single 16-inch transmission line. This 16-inch transmission line serves the OAS connections southeast of the City between the WTP and the City limits. In addition to the surface water infrastructure, the ERW is connected to the GWTP via 8,200 feet of transmission line that mainly crosses pastureland north of the City limits (LACO, 2019).

The six (6) water storage tanks provide for a total of 4.72 MG of water storage and are located throughout the City water system service area. The sizes, dates of installation, and locations of these tanks are provided in Table 2-5, below.

Table 2-5. Water Storage Tank Data. Sources: LAFCo, 2019; SWRCB, 2016.

Volume	Date Installed	Location	Pressure Zone
3 MG	1980	Baechtel Road	Main
1.5 MG	1989	Adjacent to WTP	East Hill
125,000 gallons	1993	Locust Street	Meadowbrook
43,000 gallons	1977	Laurel Street	Redwood
43,000 gallons	1980	Berry Hill	Berry Hill
3,000 gallons	Not available	Northbrook neighborhood	Northbrook
1,600 gallons	Not available	Bittenbender Pressure Zone	Bittenbender

It should be noted that the 3 MG tank in the Main pressure zone also serves the Meadowbrook, Redwood, Berry Hill, Northbrook, and Bittenbender pressure zones indirectly via the smaller pressure zone tanks listed, which receive pressurized water from the 3 MG tank.

2.3 General System Constraints

2.3.1 Water Supply

With the majority of its water supply from surface water, the City water system is susceptible to impacts from drought conditions. While the City is able to utilize groundwater from the ERW to supplement its surface water supply, based on the 8 MGM limitation on the use of groundwater (City of Willits, 2022) and the estimated monthly demand of 18.7 MGM for the entire distribution system (Communications with City Staff, 2023), the groundwater supply is insufficient to fulfill current demands on the water supply system, in the event surface water supplies are compromised. To fulfill future demand, with the current water sources and without increasing the use of groundwater supplies, the City could increase its water supply by increasing the storage capacity of its reservoirs and/or developing an additional water supply source. Either of these actions would require analysis that is outside the scope of this report as well as an amendment to the City's domestic water supply permit through the SWRCB. To address the water supply capacity the following is a list of potential projects the City could undertake to increase source capacity:

1. Perform a hydrogeologic study of the confined aquifer that supplies the ERW. The study would include groundwater modeling to further evaluate impacts to neighboring wells and constituent transport within the aquifer. Based on previous studies of the aquifer, the source capacity of the groundwater basin exceeds the surface water storage potential by tens of thousands of AF.
2. Under the current SWRCB permit (Water System No. CA 2310004) the ERW is listed as a source of water and the Ground Water Assessment sheet included in the application estimates the groundwater source production at 131 MG (or 402 AF) per year . This annual production would satisfy approximately 50 percent of the City's current water demand. The positive production at the GWTP is limited by the pressure in the distribution system at the point of connection and additional analysis is necessary to identify alternatives to overcome the pressure to achieve a higher production rate. These alternatives could include increasing the pressure at the GWTP and installing pressure reduction systems at individual connections in the GWTP vicinity, as necessary; or installing a separate water line that connects the GWTP directly to one of the storage tanks within the distribution system, thereby avoiding the pressure increase at the point of connection.
3. Dredge Morris Reservoir to remove sedimentation from that has accumulated since 1926. According to the reservoir construction plans, the reservoir would have a capacity of 940 AF at the current maximum water surface elevation. This is an increase of 278 AF in storage (42 percent) or just over 90 MG. However, this would require the removal and disposal of nearly 450,000 cubic yards, which could cost approximately $10 to 20 million.
4. Increase the height of the flashboards at Morris Dam. "The 1985 Water System Master Plan indicated that increasing the Morris Dam flashboard height to 3.7 feet would provide 60 AF of additional storage capacity" or approximately 20 MG (West Yost, 2006).
5. Raise the flashboards at Centennial Reservoir. The City is currently working on a project that will replace the wood flashboards with an inflatable dam that will improve safety and provide better control over water surface elevation and storage. To determine the potential increase in storage capacity, a bathymetric survey would need to be conducted.
6. Raise or replace Morris Dam. Increasing the height of Morris Dam by 50 feet would increase the storage capacity by 2,000 to 3,000 AF (West Yost, 2006). Since the West Yost study in 2006, the City commissioned a structural evaluation of the dam which determined the dam could be raised up to 20 feet without demolition of the existing dam.

In order for the City to amend the existing drinking water permit, at least two of the steps detailed above would have to be completed to provide a more balanced basis for calculating the number of connections available to support future growth. At a minimum, the additional water storage within the distribution would be necessary to resolve the deficiencies noted in the 2016 letter from the SWRCB Division of Drinking Water and additional source capacity developed either through groundwater system improvements or reservoir modifications and/or maintenance.

The City would then submit an application for an amended domestic water supply permit per Title 22, Section 64556 of the California Code of Regulations, subsection (a) (5), "Expansion of the existing service area by 20% or more of the number of service connections specified in the most recent permit or permit amendment." This application is available on the SWRCB's website (SWRCB, 2020).

2.3.2 Infrastructure

Infrastructure constraints include both distribution system and storage limitations. These constraints are dependent, in part, on the pressure zone within the system. Based on storage tank capacity alone, the theoretical maximum service connections for the 3 MG tank (directly serving the Main pressure zone and indirectly serving the Meadowbrook, Redwood, Berry Hill, Northbrook, and Bittenbender pressure zones) was estimated to be 3,613 in 2016 and at that time, there were 2,302 connections already established (SWRCB, 2016). Per the SWRCB (2016), expansion of the City's service area by more than 20-percent of the number of service connections would require approval of a domestic water supply permit amendment through the Division of Drinking Water. Theoretically, 20 percent of the 2,302 total connections in 2016 would be 460 connections that could be added to the City's water system without an amendment to the City's domestic water supply permit through the SWRCB Division of Drinking Water. Since 2016, approximately 40 additional connections have been approved and installed leaving approximately 420 additional connections that could be approved without amendment This 2016 analysis additionally found that the Bittenbender, Northbrook, Berry Hill, and Laurel Street pressure zones had deficient storage both with and without considering fire flow needs and Locust Street was found to have deficient storage when considering fire flow needs (SWRCB, 2016). Additional connections should not be established in these pressure zones without an increase in the storage tank capacity available within each specific area.

In addition to storage capacity, the size of distribution mains in areas considered for expansion would need to be reviewed as well as the water pressure available for fire flow purposes. For instance, the water main that runs along Locust Street between Della Avenue and the water storage tank is 6-inch asbestos cement pipe. For any substantial development to occur south of Della Avenue, the size of the water main would need to be increased to accommodate domestic usage and fire flow requirements. The development of a water system master plan would provide the City with a tool with which it could accurately determine the water infrastructure improvements necessary to accommodate future developments.

In summary, the ability of the City to source both groundwater and surface water combined with the amount of source water available creates the opportunity for the City to support future growth. This support could be accomplished with planned improvements directed towards improving the groundwater access and delivery systems along with regular maintenance to improve and maintain surface water storage capacity.

3.0 CITY OF WILLITS WASTEWATER SYSTEM

The City owns, operates, and maintains a public wastewater system that includes wastewater collection infrastructure, a wastewater treatment plant (WWTP), and water reclamation facilities. This section describes the existing conditions of the wastewater collection and treatment system.

3.1 Wastewater System Service Area and Infrastructure

As provided in Table 3-1, below, the City wastewater system serves an estimated population of 8,600 people, including 5,000 people in the incorporated City, 3,300 people in the Brooktrails Township Community Services District (BTCSD), 200 people in the Meadowbrook Manor County Sanitation District (Meadowbrook), and 100 people at the Rancheria. The OAS areas are shown on Figure 2-2, above and Figure 3-1, below, shows the City's overall wastewater collection system. The BTCSD, has approximately 1,560 OAS connections that are served by agreement, with the City having provided wastewater treatment and disposal services to the BTCSD since 1967, Meadowbrook since 1956, and the Rancheria since 1989 (LAFCo, 2019; City of Willits, 2016).

DATE: 02/22/2008	REVISIONS:		
DRAWN BY:			
CHECKED:			
PROJECT #:			
SHEET 1 OF 1		SCALE: 1"=1000'	

MAGNETIC

SEWER MANHOLE LOCATIONS

CITY OF WILLITS, CALIFORNIA

City of Willits
Engineering Department
380 East Commercial St.
Willits, California 95490-3188

CITY OF WILLITS

Table 3-1. Geographic breakdown of population serviced. Source: LAFCo, 2019 revised.

Location	Population Served
Within City Limits	5,000
Brooktrails Township Community Services	3,300
Meadowbrook Manor Sanitation District	200
Sherwood Valley Band of Pomo Indians	100
Total	**8,600**

The City's wastewater collection system consists of 22 miles of gravity-fed sewer mains ranging in diameter from 4 to 24 inches, one (1) lift station, and 450 manholes (LAFCo, 2019). The WWTP was constructed in 1975 as a secondary aeration treatment plant and has since gone through several upgrades. Currently, the WWTP utilizes grit removal, two (2) extended aeration basins, a circular clarifier, ultraviolet (UV) disinfection, and an enhanced effluent polishing in a 30-acre treatment wetland. The WWTP also includes associated reclamation and disposal facilities. In accordance with the City's Waste Discharge Requirements and Master Recycling Permit (Order No. R1-2021-0021) issued under National Pollutant Discharge Elimination System (NPDES) permit No. CA0023060 by the North Coast Regional Water Quality Control Board (Regional Board), treated effluent is discharged to Outlet Creek (downstream of the confluence of Broaddus Creek and Baechtel Creek) from October 1 through May 14. From May 15 through September 30, treated effluent is recycled as irrigation water on the surrounding pasture lands.

3.2 Current Wastewater Production

The WWTP has a maximum allowable daily flow (design capacity) of 7.0 MGD, with a permitted average monthly flow of 4.0 MGD (LAFCo, 2019) and an average dry weather flow capacity of 1.13 MGD (City of Willits, 2023b). The City currently treats and average of 0.65 MGD during the dry weather season, which is assumed to not include infiltration and inflow (I/I) flows. The WWTP receives an average of 1.2 MGD in wet weather flow, meaning that I/I is responsible for approximately 46 percent of the inflow to the WWTP. Additionally, pursuant to a 2014 contract amendment between the City and BTCSD, the BTCSD has an exclusive right to dispose of 0.49 MGD of effluent. The BTCSD contributes approximately 30 percent of the effluent treated at the WWTP (LAFCo, 2019).

The average yearly inflow for the plant is 274 MG. Table 3-2, below, provides average daily wastewater flows for 2021 and 2022. The flows reported are based on dry weather flows reported from June 1 to September 30. Due to the observed I/I in wet weather months (October 1 to May 31), dry weather flows provide a more accurate summary of average wastewater flows.

Table 3-2. Average daily wastewater production. Source: City of Willits, 2023b.

Year	Willits (MGD)	BTCSD (MGD)	Total (MGD)
2021	0.37	0.20	0.57
2022	0.41	0.22	0.63
Average	0.39	0.21	0.60

Table 3-2 shows the breakdown of average dry weather wastewater flow rates for two consecutive years that differ in total wastewater treated. However, the average contribution is the same (within less than one percentage point) at 65 percent of the wastewater produced by the City of Willits (including Meadowbrook and Sherwood Valley Band of Pomo Indians) and 35 percent produced by the BTCSD.

Under the City's NPDES permit, the wastewater treatment facility measures and monitors specific constituent concentrations at four primary locations: 1) the raw sewage as it enters the facility or INF-001; 2) at a point between the mechanical treatment plant on the west side of Outlet and Broaddus Creek and the enhancement wetlands on the east side of Outlet Creek, or EFF-002/INT-002; 3) at the outlet of the enhancement wetlands at the north end where treated wastewater is discharged into outlet creek, or EFF-003; and 4) at the outlet of the enhancement wetlands at the north end where treated wastewater that meets Title 22 Secondary-23 requirements is pumped to the north to irrigate pastures for fodder for non-dairy cattle. Each of the discharge points has different effluent quality requirements and the City has continuously met the treatment requirements. A summary of average constituent concentrations and wastewater characteristics are shown in Table 3-3, below.

It is also important to note that the City is currently the only wastewater treatment facility in Mendocino County that accepts septage from septic haulers. The significance is that the septage brought in to the WWTP comes from private septic tanks and portable toilets and is a highly concentrated load of wastewater that is more difficult to treat than the standards domestic wastewater from the collection system. This septage is discharged into a septage receiving station that measures the volume for billing purposes and is then piped to a holding pond to the west of the treatment plant office. The concentrated flow is then mixed with higher flows during the winter so that it can be effectively treated.

Table 3-3. Typical wastewater characteristics for the City of Willits.

Characteristic	Year and Concentration		
	2020	***2021***	***2022***
Biosolids (tons)	127.3	76.7	112.8
Septage Received (MG)	1.87	1.96	2.05
Influent (INF-001)			
BOD (avg)	381	244	240
pH (avg)	7.3	7.2	7.2
Total Suspended Solids (avg mg/L)	260	216	261
Maximum Influent (MGD)	3.6	5.5	7.9
Effluent to Enhancement Wetlands (EFF-002 or INT-002)			
BOD (avg)	6.1	5	5
pH (avg)	7.0	7.0	7.0
Total Suspended Solids (avg. mg/L)	1.6	1.8	1.7
Total Coliform (avg)	11.7	3.2	1.8
Total Nitrogen (avg mg/L)	2.8	3.2	3.3
Maximum Effluent (MGD)	1.3	3.8	4.1
Effluent to Outlet Creek (EFF-003)			
Total Nitrogen (avg mg/L)	1.5	1.6	1.5
Phosphorus (avg mg/L)	2.1	1.2	1.4
Total Hardness (CaCO3 avg mg/L)	86	105	107
Effluent to Irrigation (EFF-004)			
Total Nitrogen (avg mg/L)	3.6	3.5	4.6
Phosphorus (avg mg/L)	14	2.3	3.3
Chloride (avg mg/L)	63.1	67.8	35.4
Boron (avg mg/L)	0.3	0.4	0.3
Sodium (avg mg/L)	51.7	57.5	36.6

3.3 General System Constraints

Generally, the WWTP and collection system are adequately sized to support future growth. However, as the City grows and the sphere of influence (SOI) expands, one constraint will be the ability to convey the wastewater by way of gravity. As the end users move further away from the WWTP, sewer lift stations will be required in some areas. Expansion into the Locust Street area, for instance will require a lift station based on topography. The one benefit to a lift station is being able to pump the raw sewage through a smaller pipe to a point where that volume of sewage can be conveyed in the existing collection system.

Considering the average dry weather flow for the City over the past two years has been 0.39 MGD (389,314 GPD), the City has 0.25 MGD remaining in its portion of the treatment capacity. This equates to a capacity for an increase of 64 percent in wastewater production. Modifications to the WWTP would likely be necessary as wastewater flows increase and near design capacities.

4.0 CITY OF WILLITS STORM DRAIN SYSTEM

The City maintains storm drains citywide. This section describes the existing conditions of the City's storm drain system.

4.1 Storm Drainage System Conditions

The City's storm drain system consists of approximately 5.6 miles of storm drain lines as well as open channels and ditches. Of the storm drain lines, Table 4-1, below, summarizes the type and lengths used within the City storm drain system. These facilities are part of an integrated system of roadside gutters, drainage ditches, and storm drain lines that are used to collect and convey the stormwater runoff from the City to the system's discharge points in Broaddus, Mill, Baechtel and Haehl Creeks. These creeks and all other drainages in the Little Lake Valley ultimately convey stormwater to Outlet Creek, which leaves the valley at the north end and is a tributary to the Main Fork of the Eel River.

Table 4-1. Storm drain pipe type and length. Source: City of Willits, Not Dated.

Type	Total Length Used (ft)
Corrugated Metal Pipe (CMP)	14,370
Reinforced Concrete Pipe (RCP)	10,235
Clay	3,544
*Plastic	1,470
Total	29,619 ft (5.6 miles)

*Includes High Density Polyethylene (HDPE), Polyvinyl chloride (PVC), & PVC SDR-35

Although the County of Mendocino (County) developed a Storm Water Management program for unincorporated urbanized areas within the County to comply with the Federal Stormwater Phase II Final Rule (Phase II Rule), the rule only applies to operators of small municipal separate storm sewers (MS4s). As the City is not an MS4, it is not subject to the Phase II Rule. However, in 2009, the City developed Low Impact Design (LID) Guidelines for Stormwater Management for new developments and new stormwater infrastructure.

The City is responsible for maintenance of the storm drain system within the City limits. As the southern portion of Main Street is also identified as Highway 20, storm drain facilities along Main Street from Highway 20 to the north to the Highway 101 off-ramp to the south are maintained by Caltrans. Additional roadside drainage facilities outside the City limits are maintained by the County, who owns and maintains County roads.

4.2 General System Constraints

The City is located within the Little Lake Valley, which contains a large marshy area at the northern extent of the valley that flood seasonally. The extents of the Little Lake Valley Groundwater Basin, surface water bodies, and the flood zones mapped by the Federal Emergency Management Agency (FEMA) are shown in Figure 4-1, below.

During some winter seasons, the northern extent of the valley forms Little Lake, a shallow lake that spans several hundred acres (City of Willits, 2020). Peak flows increase on the northern end of the City limits, nearer the confluence of the various creeks and localized flooding occurs every two (2) to three (3) years along East Commercial Street and East Valley Street. This is also typical for the Walnut Street area; Highway 20, Manor Way, and Alder Lane at the south end of the City; and other areas adjacent to Broaddus, Baechtel, and Mill Creeks.

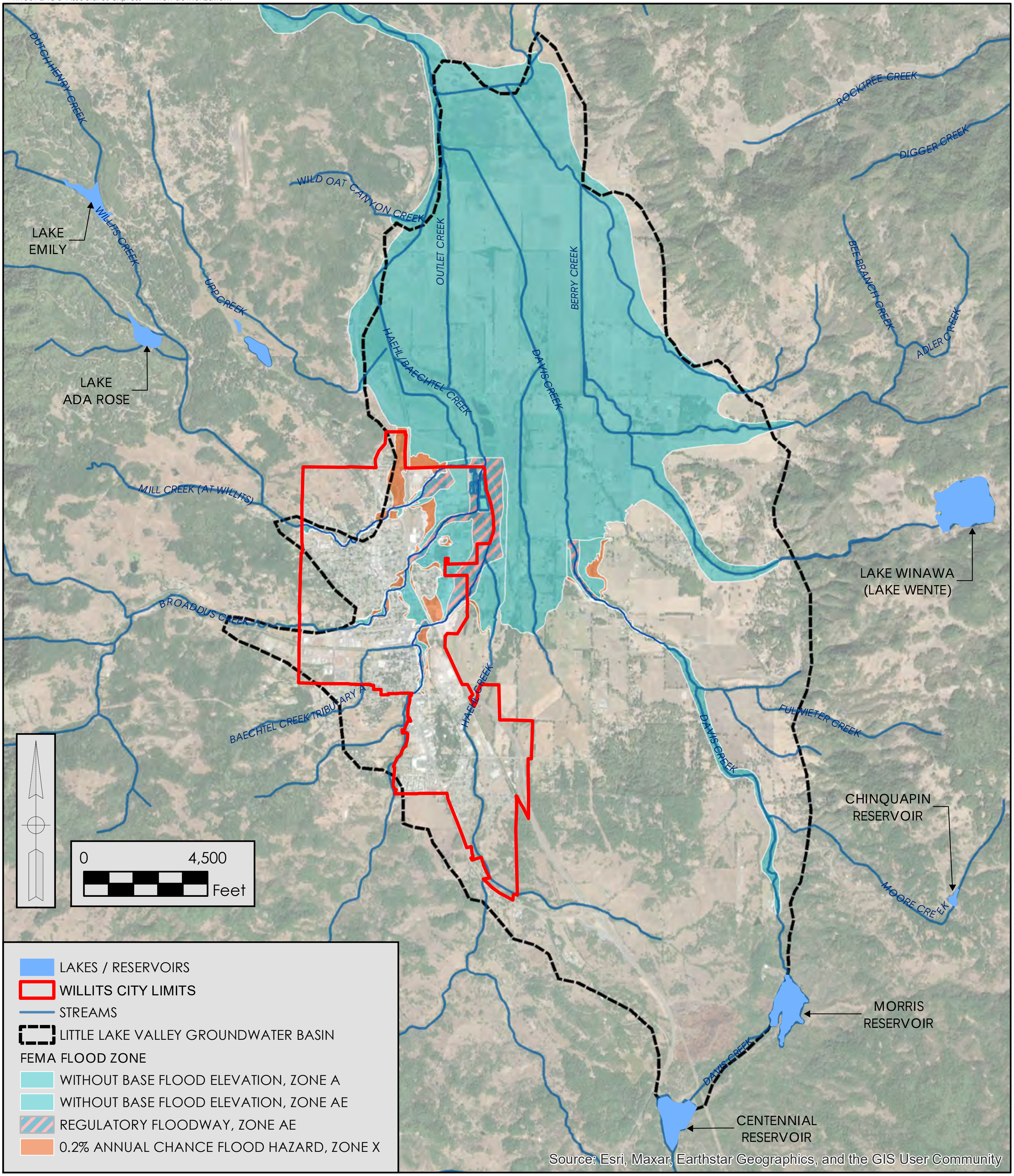
From a hydrologic perspective, the stormwater flows within the City limits tend to peak quickly during an intense rainfall event and recede quickly once the intensity decreases. This is primarily based on the location of the valley near the upper end of the Outlet Creek watershed. When considering the hydraulics associated with the drainage within the City, there are three primary limiting factors:

1. Undersized drainage facilities.
2. Overgrown and blocked stream channels.
3. Water surface elevation in receiving waters.

These three factors have distinct impacts to drainage and overlap during a storm event. For instance, the drainage channel along the north side of Walnut Street has become a narrow channel that has been overgrown with vegetation and passes under Highway 20 through a box culvert that does not have the capacity to convey peak flows during storm events that are less than five-year events. The issues at the south end of town are caused by undersized drainage facilities that are either owned by Caltrans or on private property. The only place the drainage system crosses the City right-of-way is at Manor Way and the drainage pipe is within a storm drain easement of unknown ownership.

Regardless of the adequacy of the drainage system capacity, the water surface elevation in the receiving water can restrict flow and cause stormwater to backup into the City roadways. This becomes more problematic at the northern end of the City as the water level in the creeks and in the valley increase as stormwater accumulates. A separate drainage study, or studies to evaluate the problematic areas of the City is needed to better define the constraints and identify mitigation opportunities.

LACO	PROJECT Land Use Element Update Existing Conditions Report	BY JRG/MCH	FIGURE 4-1
EUREKA • UKIAH • SANTA ROSA	CLIENT City of Willits / Planwest Partners, Inc.	CHECK RMD	
	LOCATION Willits, California	DATE 03/30/2023	JOB NO. 7376.05
1-800-515-5054 www.lacoassociates.com	FEMA Flood Zone and Water Resources Map		



5.0 RECYCLING AND SOLID WASTE

5.1 Recycling and Solid Waste Collection System

The Mendocino Solid Waste Management Authority (MendoRecycle) was formed in 1990 by the County and three (3) cities (Ukiah, Willits, and Fort Bragg) to provide administrative oversight and program implementation for solid waste and recycling in the County. MendoRecycle also operates the household hazardous waste facility in Ukiah (MendoRecycle, 2023). The Mendocino County Division of Environmental Health (EH) serves as the Local Enforcement Agency (LEA) for the California Integrated Waste Management Board (CIWMB), issuing permits and inspecting solid waste facilities for compliance with state laws. EH regulates and inspects more than 50 solid waste facilities in Mendocino County, including: 5 closed/inactive municipal landfills, 3 woodwaste disposal sites, 2 composting facilities, and 11 transfer stations (County of Mendocino, 2023). According to Chapter 3 (Development Element) of the Mendocino County General Plan (2009), there are no operating landfills within the County; as such, solid waste generated throughout the County is exported to the Potrero Hills Landfill in Solano County for disposal. The Potrero Hills Landfill has a maximum permitted throughput of 4,330 tons per day and a remaining capacity of 13.872 million cubic yards. The landfill is anticipated to remain open until February 14, 2048 (CalRecycle, 2019).

The City has a Franchise Agreement (Agreement) with Solid Wastes of Willits, Inc. (SWOW) for solid waste collection, transportation, disposal, and recycling for the City and surrounding areas. The City's current Agreement with SWOW is dated November 1, 2015 and is set for expire December 31, 2023, unless extended or terminated by that date. Within the area covered by the Agreement (2015), SWOW is generally responsible for collecting solid waste, mixed organic waste, and recyclable materials; transporting collecting materials to the appropriate disposal/processing site; processing recycling materials; collecting demolition and construction debris; and operating a recyclable material buy-back center. Curbside pickup for both garbage and recycling occurs Monday through Friday depending on the location within the City. In addition, SWOW maintains a recycle center at the Willits Transfer Station located on the west side of the City at 350 Franklin Street. Recyclables are accepted at no charge and may include: newspapers, cardboard, office paper, food and beverage glass, steel cans, plastic food and beverage containers, and aluminum cans. Yard waste is picked up on Fridays with an alternating schedule between areas located west and east of the former US Highway 101 corridor. From the transfer station, the sorted recyclables are then baled and shipped to various brokers and manufacturers for reuse. Non-recyclable solid wastes are transported to a permitted landfill for disposal.

5.2 General Service Constraints

There are currently no known recycling and solid waste service constraints in the City.

6.0 CONCLUSION

As has been described throughout this Report, the City manages water, wastewater, and stormwater systems and recycling and solid waste services that serve the City and surrounding areas. While this Report provides a general overview of these systems and services, it should not be considered to be comprehensive assessment of the entirety of the City's water, wastewater, and stormwater systems nor the recycling and solid waste services provided by the City.

Depending on the scope and location of future development in the City, additional in-depth studies of the City's water, wastewater, and stormwater systems will be needed to inform the scope of needed improvements and/or modifications, if any. Observed inconsistencies in source documents and reports should be further reconciled, where needed, in future study of these systems.

7.0 REFERENCES

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APPENDIX 2

Source and Storage Capacity Evaluation, State Water Resources Control Board, 2016

State Water Resources Control Board
Division of Drinking Water

March 1, 2016

Ms. Adrienne Moore, City Manager
City of Willits
111 East Commercial Street
Willits, CA 95490

REQUEST TO EVALUATE ADDITIONAL WATER SERVICE CONNECTIONS, CITY OF WILLITS PWS#2310004

Dear Ms. Moore,

Attached is the completed Source and Storage Calculation requested by Mr. Scott Herman on behalf of the City of Willits.

Based on data the City has submitted to the Division of Drinking Water, including fire flow, the theoretical maximum service connections for the Main Zone is 3,613. There are currently 2,302 connections that receive water from the 3 MG tank (directly and indirectly via other pressure zone tanks). This leaves 1,311 connections to be added to be at 100-percent storage capacity in the Main Zone. Please be advised, this is purely a theoretical model only evaluating storage tank capacity. The Division did not evaluate whether the distribution system is able to serve the additional connections nor is this an endorsement to add 1,311 more connections.

Expansion of the existing service area by more than 20-percent of the number of service connections requires approval of the Division of Drinking Water- Mendocino District via a permit amendment. Twenty-percent of the current total number of connections is 460 connections.

Per Section 64556, Title 22 of the California Code of Regulations, an application for an amended domestic water supply permit shall be submitted to the Division if any of the following changes are made:

a. Modification of water supply including adding a new source, changing status of existing source or altering a source such that the quantity or quality of supply could be affected.
b. Any addition or change in treatment including design capacity or process.

c. Addition of a new distribution reservoir of 100,000 gallon capacity or greater.
d. Expansion of the existing service area by 20% or more of the number of service connections specified in the most recent permit or permit amendment.

If you have any questions regarding the above inspection items, please contact Joy Wildflower at (707) 576-2818.

Sincerely,

Sheri K. Miller, P.E.
District Engineer
Mendocino District

Enclosure: Source and Storage Calculation

c: Mr. Scott Herman, Utility Superintendent
380 East Commercial Street
Willits, CA 95490

2310004/Capacity
160301_20%expansion_Ltr/JMW

SOURCE & STORAGE CAPACITY EVALUATION
CITY OF WILLITS; population: 2,450

Year	No. of Conn	Total Water Production (MG)			Average Daily Usage (gpdc*)		
		Annual	Max. Month	Max. Day	Annual	Max Month	Max Day
2005	2,066	357.9	46.9	1.84	475	732	891
2006	2,048	405.6	50.6	2.18	543	797	1,064
2007	2,340	392.5	44.6	1.71	460	615	731
2008	2,443	375.3	44.4	1.81	421	586	741
2009	2,435	328.1	37.1	1.49	369	491	612
2010	2,363	295.7	--	--	343	--	--
2011	2,374	269.6	32.6	1.51	311	443	636
2012	2,296	281.9	33.8	1.85	336	475	806
2013	2,367	298.5	35.8	1.46	346	488	617
2014	2,356	314.8	35.2	1.34	366	482	569

1. identify the day with the highest usage during the past ten years to obtain MDD; determine the average hourly flow during MDD and multiply by a peaking factor of at least 1.5 to obtain the PHD.

OR

1. To calculate the MDD, multiply the average daily usage by a peaking factor that is a minimum of 1.5; and
2. To calculate the PHD, determine the average hourly flow during MDD and multiply by a peaking factor that is a minimum of 1.5.

SOURCE EVALUATION

Source Name	Capacity (GPM)
Alias Well	360
SWTP	2,291
TOTAL (24 hours/ day)	2,651 GPM
	3.82 MG

TOTAL SOURCE CAPACITY	3.82 MG
MDD	2.18 MG
PHD	0.14 MG
4-Hour PHD (LWS)	0.55 MG

SOURCE & STORAGE EVAL

COMBINED SOURCE & STORAGE CAPACITY	8.54 MG

STORAGE EVALUATION

Zone	Connections (based on 2,450 total)	Storage Capacity	Fire Flow (gallons)	Total Storage Required (w/ fire flow)	Total Storage Required (w/o fire flow)	% of required Storage Available (w/ fire flow)	% of required Storage Available (w/o fire flow)
(2) East Hill	148	1.5 MG	240,000	353,331	113,331	424	1324
(3) Bittenbender	15	1,600	0	11,486	11,486	Deficient Storage	
(4) Northbrook	20	3,000	0	15,315	15,315	Deficient Storage	
(5) Berry Hill	128	43,000	60,000	158,016	98,016	Deficient Storage	
(6) Locust St	165	125,000	63,120	189,469	126,349	Deficient	99
(7) Laurel St	159	43,000	60,000	181,754	121,754	Deficient Storage	
(8) Main	1815	3 MG	229,800	1,619,636	1,386,836	185	216
TOTAL	2,450	4.72 MG	652,920	2.53 MG	1.87 MG	186	252

Total Storage Required= *(Fire Flow)* + (Max average day production)*(conn) + (Max peak day production)*(conn)*(0.25)

max average= 543 gpdc

max peak= 891 gpdc

Total Combined Capacity meets or exceeds 4-hour PHD (LWS) or MDD (SWS)	☒ Yes	☐ No
MDD is met as system as a whole (LWS & SWS)	☒ Yes	☐ No
MDD is met in each individual pressure zone (LWS & SWS)	☐ Yes	☒ No
PHD is met as system as a whole (LWS & SWS)	☒ Yes	☐ No
PHD is met in each individual pressure zone (LWS & SWS)	☐ Yes	☒ No