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memorandum

date March 3, 2026
to Wyandotte Creek Groundwater Sustainability Agency
cc Rebecca Fairbanks, Butte County; Christina Buck, Butte County; Ryan Fulton, LWA
from Jason Wiener, ESA
subject Wyandotte Creek Groundwater Subbasin – Groundwater Dependent Ecosystem Technical Study

Introduction and Background

The original Wyandotte Creek Subbasin Groundwater Sustainability Plan (2022 WCGSP) submitted to the California Department of Water Resources (DWR) in 2022 creates the framework for sustainable management of groundwater in the Wyandotte Creek Subbasin (Subbasin). The 2022 WCGSP includes a detailed characterization of groundwater conditions in the Subbasin, establishment of a sustainability goal and sustainable yield, and description of projects and management actions the GSA will implement to maintain sustainable groundwater management through 2042 and beyond.

Pursuant to Recommended Corrective Actions (RACs) provided in DWR's Determination Letter on the 2022 WCGSP,¹ the GSA is required to submit an amended GSP to DWR by January 31, 2027. The amended GSP and associated Periodic Evaluation are currently underway and will address DWR's RCAs and include updated Sustainability Management Criteria (SMCs) and monitoring networks for nearly all Sustainable Groundwater Management Act (SGMA) sustainability indicators. Findings and recommendations from this analysis will be incorporated into the amended GSP and Periodic Evaluation as determined by the GSA board.

Under SGMA, Groundwater Sustainability Agencies are required to identify and consider the interests and impacts to beneficial uses and users of groundwater, including environmental users of groundwater such as groundwater dependent ecosystems (GDEs). GDEs are defined by the State of California as "ecological communities of species [plants, animals, and natural communities] that depend on [to meet some or all their water needs] groundwater emerging from aquifers or on groundwater occurring near the ground surface". GDEs are incredibly diverse (e.g., wetlands, springs, seeps, rivers, oak woodlands) and often host rare and endemic species that are protected under state and federal endangered species act.

¹ Wyandotte Creek Subbasin Determination Letter is available for download here:
<https://sgma.water.ca.gov/portal/gsp/preview/99>

Uncertainty regarding the baseline condition and ecological value of the Subbasin's GDEs were identified by the GSA in the 2022 WCGSP and by DWR in their "Statement of Findings Regarding the Approval of the Sacramento Valley Basin -- Wyandotte Creek Subbasin Groundwater Sustainability Plan" as having data gaps.

Analysis Objectives and Scope

This analysis was conducted to address the GDE data gaps identified in the 2022 WCGSP including documentation of the baseline condition and ecological value of the Subbasin's GDEs. A second objective of this analysis was to proffer recommendations for potential approaches to long-term GDE monitoring. The analysis accomplished these objectives through:

- Characterization of the baseline ecological conditions of GDEs, where ecological condition is a representative qualification of how a GDE is functioning with respect to providing habitat.
- Conducting preliminary field surveys of a subset of representative GDEs to guide selection of potential GDEs for future long term monitoring.
- Developing a set of representative GDEs recommended for potential future long term GDE monitoring.
- Developing a recommended approach for potential future long term GDE monitoring as part of refining Sustainable Management Criteria (SMCs) to avoid significant and unreasonable impacts to GDEs.

This analysis is intended to complement a separate technical analysis completed by ESA (2026) that focused on characterization of baseline physical and hydrologic conditions, refined mapping, and ecohydrologic analysis of the Subbasin's GDEs.

Study Area

The Study Area for this analysis was the Wyandotte Creek Subbasin as described in the 2022 WCGSP (**Figure 1**). The Wyandotte Creek Subbasin lies in the eastern central portion of the Sacramento Groundwater Basin. It is bounded on the west by the Feather River and Thermalito Afterbay; in the south by the Butte-Yuba County line (except for Ramirez Water District which is fully within the North Yuba Subbasin); and on the north and east by the edge of the alluvial basin as defined by DWR Bulletin 118 - Update 2003 (DWR, 2003). It is surrounded by the Butte Subbasin to the west, the Vina Subbasin to the north, the North Yuba Subbasin to the south and the foothills to the east.

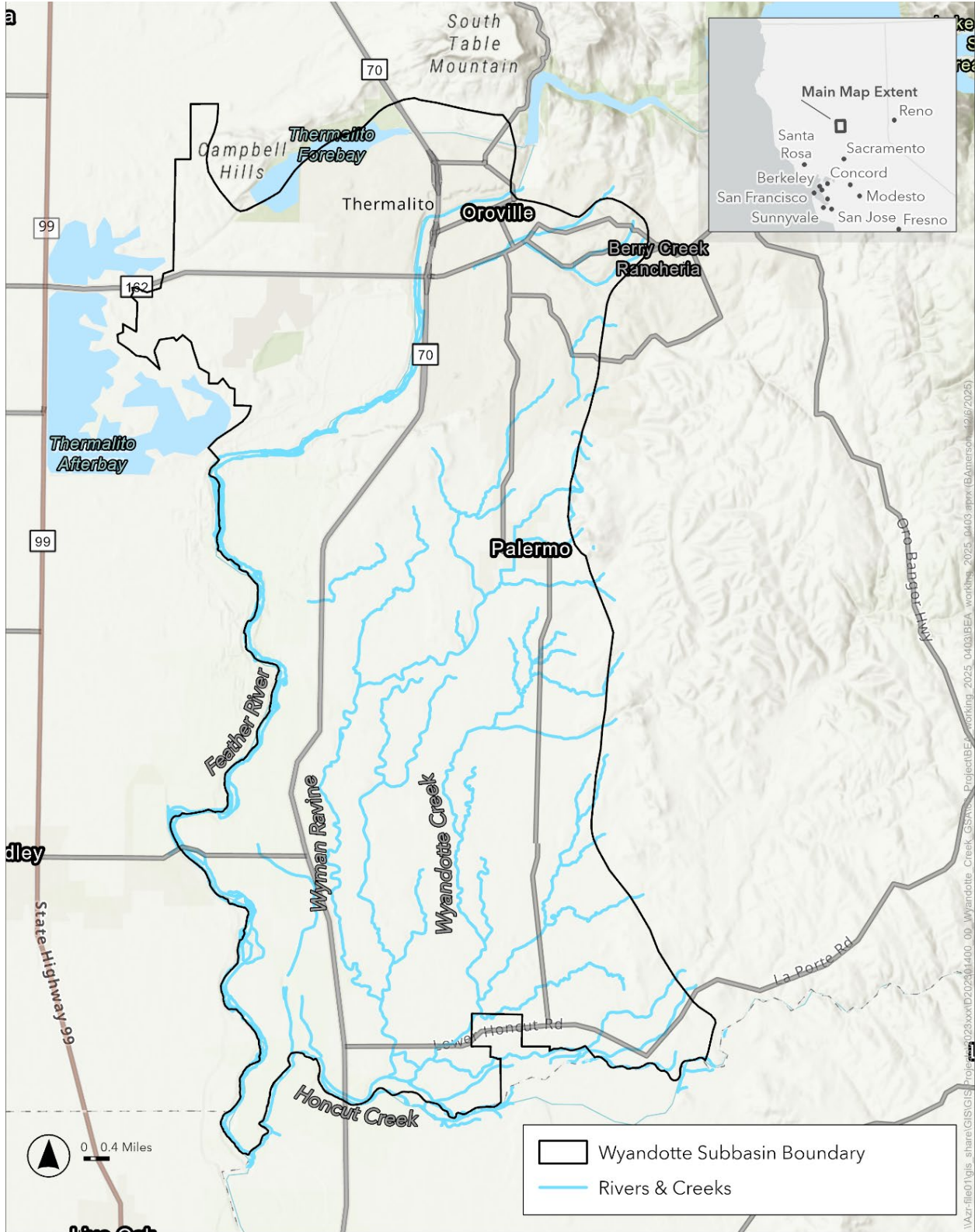


Figure 1. Map of the Wyandotte Subbasin and study area showing creeks, streams and unnamed drainages

Methods

Special-Status Species Evaluation Methods

Identifying the ecological value of each potential GDE can help to prioritize limited resources as well as prioritize legally protected species or habitats that may need special consideration when setting sustainable management criteria (Rohde et al. 2018). The ecological value of a potential GDE is higher for those that possess natural or near-natural conditions or include species or habitats that have legal protection (Serov et al. 2012). As such, a review of special-status species records was conducted as a preliminary step in assessing beneficial users and ecological value of potential GDEs in the Wyandotte Creek Subbasin (Subbasin), and can be used to inform selection of possible future monitoring locations.

For the purposes of this document, special-status species include the following:

- Species that are listed, proposed, or under review as endangered or threatened under the federal Endangered Species Act (ESA) or the California Endangered Species Act (CESA).
- Species designated by CDFW as Species of Special Concern.
- Species designated by CDFW as Fully Protected under the California Fish and Game Code.
- Species designated as rare under the California Native Plant Protection Act (CNPPA) and/or included on CDFW's most recent Special Vascular Plants, Bryophytes, and Lichens List (CNDDDB 2026) with a California Rare Plant Rank (CRPR) of 1, 2, 3, or 4.

Special-status species records from the California Natural Diversity Database (CNDDDB) (CDFW 2026), the California Freshwater Species Database (Klausmeyer et al. 2015), and other publicly available datasets (CalFlora 2026; eBird 2026; iNaturalist 2026; UC Davis CWS 2026) were reviewed to document and evaluate locations of special-status species within the Subbasin and potential GDE areas. In addition, ESA reviewed designated critical habitat for federally listed species in relation to potential GDE locations (USFWS 2026; NMFS 2026).

We performed a search of CNDDDB and other aforementioned datasets for all special-status species records within 5 miles of the Subbasin. Records with extirpated populations were disregarded, as most of these records are historical, tend to have poor spatial accuracy, and often don't accurately reflect current conditions. Historical records over 100 years old and records for species known only as rare vagrants were also disregarded. Focus was given to species that utilize habitats that are often associated with GDEs and are likely to be affected by groundwater management. The Critical Species Lookbook was reviewed to identify State and Federally listed species known to occur within the Subbasin that are directly or indirectly reliant on groundwater for water availability, nutrient access, and thermal regulation (Rohde et al., 2019b).

Field Survey Methods

A windshield survey of a representative subset of Subbasin GDEs was completed by ESA biologists Alyssa Caldwell and Noah Teller on February 19th, 2026. The primary intent of the survey was to help inform selection of GDEs for potential future long term monitoring (see Recommendation Section). In this manner the windshield survey focused on documenting the following:

- Verification of presence/absence of mapped GDEs based on existing vegetation, landform, waterways, and structures.
- Verification of prior vegetation mapping and minor updates to classification.
- Documentation of access and potential access limitations.
- Proximity to existing or proposed monitoring network locations.

Based on coordination with representatives from the Wyandotte Creek Groundwater Sustainability Agency, the windshield survey focused on GDEs classified as Class 1 according to the clustering analysis described in ESA (2026). Class 1 GDEs occurred in the central and southern lowland portions of the basin below 120 ft in elevation (NAVD 88) and were generally located near the basin's rivers and creeks including the Feather River, Honcut Creek (north and south), Wyman Ravine, and unnamed tributaries. Class 1 GDEs were characterized as having shallow depths to groundwater (<25 ft), low mean annual rainfall (<26 in), and generally occurred on alluvium or other surficial deposits (Modesto or Riverbank formation). These areas were targeted as they appear to be supported primarily by groundwater compared to GDEs that appear to be supported by groundwater and precipitation (ESA, 2026).

Results

Special Status Species Results

Special-Status Species Evaluation

A query of the CNDDDB and other publicly available databases was conducted to identify special-status species known to occur within the Subbasin and that have potential to be affected by groundwater management actions. Species determined to be groundwater dependent or otherwise reliant on groundwater-supported habitats are presented in **Table 1**. Locations of records within the Subbasin are shown in **Figure 2**.

A comprehensive list of all special-status species evaluated, including species not reliant on groundwater or not likely to occur within the Subbasin, is provided in **Appendix A**.

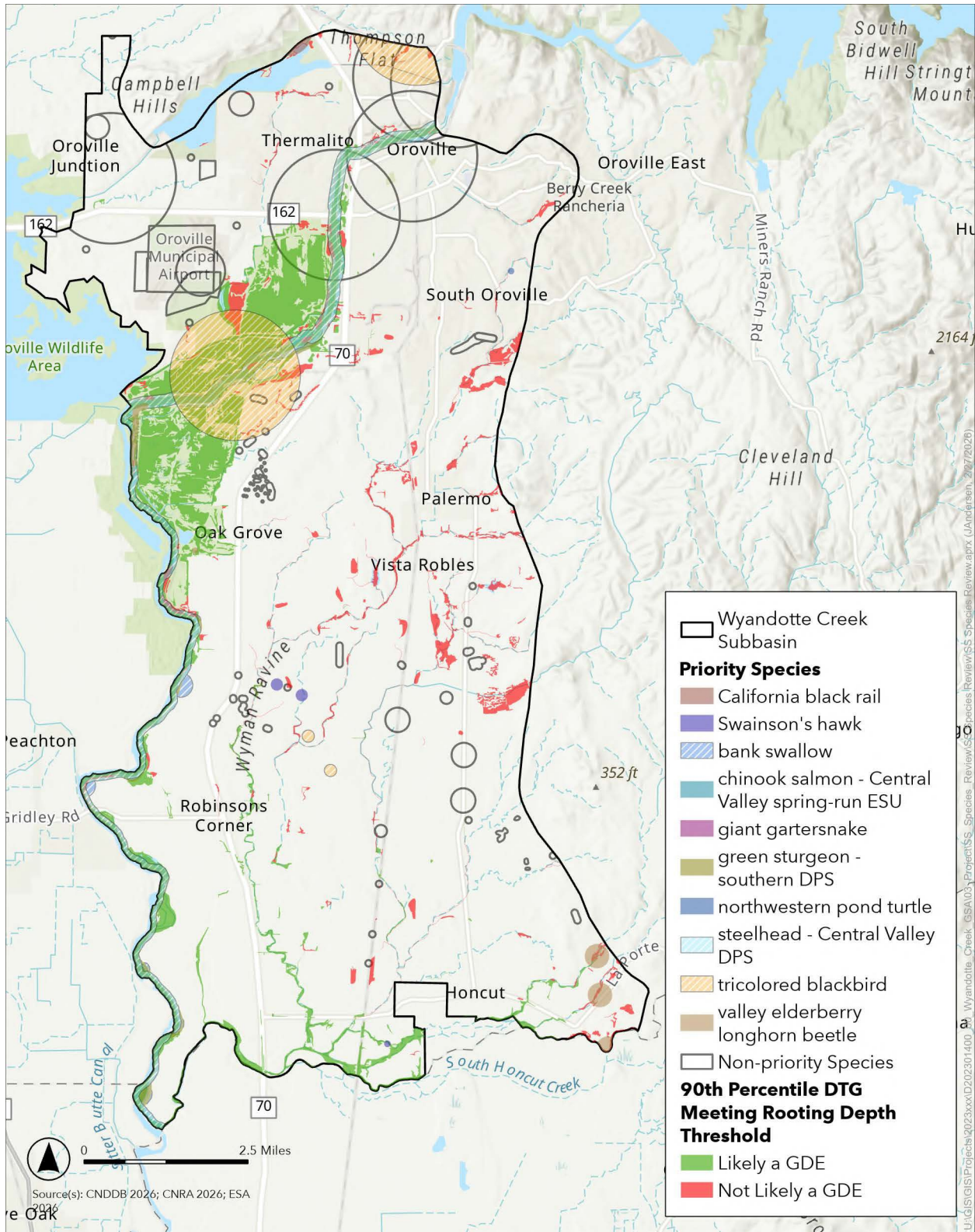


Figure 2. Map of the special-status species CNDDDB occurrences within the Wyandotte Subbasin. Priority species are those that were assessed to be reliant on GDEs.

TABLE 1
GROUNDWATER DEPENDENT SPECIAL-STATUS SPECIES KNOWN TO OCCUR IN THE WYANDOTTE CREEK SUBBASIN

Common Name Scientific Name	Status Federal/ State	Other Status	Habitat	Reliance on Groundwater ^a	Occurrence Details
Sanford's arrowhead <i>Sagittaria sanfordii</i>	-/-	1B.2 BLM_S-Sensitive	Standing or slow-moving freshwater ponds, marshes, and ditches. 0-605 m.	Relies on surface water that may be supported by groundwater.	Listed as Butte County Beneficial User. No CNDDDB records within boundary, but there are several 2025 Calfora records located in roadside ditch near Perkins Ave, Palermo, CA.
bald eagle <i>Haliaeetus leucocephalus</i>	FD/CE	BLM_S-Sensitive CDF_S-Sensitive CDFW_FP-Fully Protected IUCN_LC-Least Concern USFS_S-Sensitive	Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.	Indirect reliance on groundwater. Bald eagles are reliant on surface water that may be supported by groundwater and/or groundwater-dependent vegetation. This species often roosts and nests along lakes and rivers, where they hunt for fish living in surface water bodies that may be supported by groundwater. Listed as Butte County Beneficial User.	Known to nest in the vicinity; a nest is recorded along the riparian corridor of the Feather River within the Subbasin (Occ No. 347).

Common Name Scientific Name	Status Federal/ State	Other Status	Habitat	Reliance on Groundwater ^a	Occurrence Details
bank swallow <i>Riparia riparia</i>	-/CT	BLM_S-Sensitive IUCN_LC-Least Concern	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	Indirect reliance on groundwater. This species relies on surface water that may be supported by groundwater. Listed as Butte County Beneficial User.	Multiple records of colonies along the Feather River.
California black rail <i>Laterallus jamaicensis coturniculus</i>	-/CT	BLM_S-Sensitive CDFW_FP-Fully Protected IUCN_EN- Endangered NABCI_RWL-Red Watch List	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year and dense vegetation for nesting habitat.	Direct reliance on groundwater. The California black rail is reliant on groundwater-fed wetlands and marshes. It is found in areas with saturated soils and salt marshes, and where the groundwater table is at or above the land surface. Listed as Butte County Beneficial User.	While there are no records documented within the Subbasin boundary, Sierra foothills populations of this species are known to occur immediately outside of the north and southeast Subbasin boundary, and have potential to occur in wetlands within the Subbasin.

Common Name Scientific Name	Status Federal/ State	Other Status	Habitat	Reliance on Groundwater ^a	Occurrence Details
Swainson's hawk <i>Buteo swainsoni</i>	-/CT	BLM_S-Sensitive IUCN_LC-Least Concern	Species breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, and agricultural or ranch lands with groves or lines of trees. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations. Swainson's hawk nesting trees in the Central Valley commonly include <i>Populus fremontii</i> (cottonwood), <i>Quercus</i> spp. (oak), <i>Salix</i> spp. (willow), <i>Platanus racemosa</i> (sycamore), <i>Juglans</i> spp. (walnut), and <i>Eucalyptus</i> spp. (eucalyptus).	Indirect reliance on groundwater. Swainson's hawks often rely on groundwater-dependent vegetation in riparian woodland areas for nesting.	Nest sites within the Subbasin include riparian trees along the Feather River and Honcutt Creek. Nests have also been recorded in cottonwood and eucalyptus trees present within habitat dominated by vernal pool grasslands.

<p>Common Name Scientific Name</p>	<p>Status Federal/ State</p>	<p>Other Status</p>	<p>Habitat</p>	<p>Reliance on Groundwater^a</p>	<p>Occurrence Details</p>
<p>tricolored blackbird <i>Agelaius tricolor</i></p>	<p>-/CT</p>	<p>BLM_S-Sensitive CDFW_SSC-Species of Special Concern IUCN_EN- Endangered NABCI_RWL-Red Watch List USFWS_BCC-Birds of Conservation Concern</p>	<p>Species is mostly colonial and most numerous in Central Valley and vicinity. This species uses semipermanent and permanent wetlands with dense tracts of tall emergent vegetation for nesting, and upland habitat for both nesting and foraging. Upland nesting habitat includes groundwater-dependent grain crops (primarily silage associated with dairies). Foraging habitat includes groundwater-dependent crops and irrigated pasture.</p>	<p>Direct reliance on groundwater. Tricolored blackbirds have historically relied on emergent vegetation for breeding and roosting in groundwater-dependent wetlands, particularly semi-permanent wetlands. Irrigated pasture and some groundwater-dependent crops (especially alfalfa) provide extremely important foraging habitat for breeding colonies of this species. However, upland plants such as mustard and thistle may also be used for nesting, and in some areas, tricolored blackbirds will nest in agricultural stands of triticale or other grains. Listed as Butte County Beneficial User.</p>	<p>Records within the Subbasin describe tricolored blackbird colonies in blackberry brambles and willow trees.</p>
<p>yellow-breasted chat <i>Icteria virens</i></p>	<p>-/-</p>	<p>CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern</p>	<p>Summer resident; inhabits riparian thickets of willow and other brushy tangles near watercourses. Nests in low, dense riparian, consisting of willow, blackberry, wild grape; forages and nests within 10 ft of ground.</p>	<p>May be indirectly reliant on groundwater. Typically nests in riparian vegetation which may occur in GDEs. Listed as Butte County Beneficial User.</p>	<p>Multiple eBird records throughout Subbasin. Concentrations of records include areas along Feather River and Honcut Creek.</p>

Common Name Scientific Name	Status Federal/ State	Other Status	Habitat	Reliance on Groundwater^a	Occurrence Details
central California roach <i>Hesperoleucus symmetricus</i> <i>symmetricus</i>	-/-	CDFW_SSC-Species of Special Concern	Generally found in small streams of the Sierra Nevada foothills flowing into the Central Valley and are particularly well adapted to life in intermittent watercourses; dense populations are frequently observed in isolated pools. Rarely above 1,000 meters in elevation. Tolerant of wide temperature ranges and dissolved oxygen levels. Most abundant when only species present, occupying large pools in open water. With other fish, found in shallow margins, pool edges, or dense cover.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User.	Extant range includes the Wyandotte Subbasin.

<p>Common Name Scientific Name</p>	<p>Status Federal/ State</p>	<p>Other Status</p>	<p>Habitat</p>	<p>Reliance on Groundwater^a</p>	<p>Occurrence Details</p>
<p>chinook salmon - Central Valley spring-run ESU <i>Oncorhynchus tshawytscha</i> pop. 11</p>	<p>FT/CT</p>	<p>AFS_TH-Threatened</p>	<p>Adult Chinook spawn in larger rivers and streams, where they require sufficient flows for migration and largely sediment-free gravel for spawning. Juveniles need deep pools, cool temperatures in warm months, and areas of refuge from high water velocities during the wet season (e.g., floodplains, backwaters, etc.). Water quality, including temperature and dissolved oxygen, is important for juveniles living in estuaries. Groundwater augmentation into streams provides important cold-water refugia, particularly for winter- and spring-run juveniles in the Central Valley and foothills during hot, dry summer months. The Feather River is a known migration corridor for spring-run chinook salmon.</p>	<p>Direct reliance on groundwater. Chinook salmon are reliant on groundwater-fed rivers to provide adequate water quality, temperature, and volume for upstream migration in the fall before rainfall elevates river flows, as well as for spawning and freshwater residency. Listed as Butte County Beneficial User.</p>	<p>The Feather River is designated as Essential Habitat for Chinook Salmon and Critical Habitat for Central Valley spring-run Chinook salmon</p>

<p>Common Name Scientific Name</p>	<p>Status Federal/ State</p>	<p>Other Status</p>	<p>Habitat</p>	<p>Reliance on Groundwater^a</p>	<p>Occurrence Details</p>
<p>chinook salmon - Central Valley fall / late fall-run ESU <i>Oncorhynchus tshawytscha</i> pop. 13</p>	<p>-/-</p>	<p>AFS_VU-Vulnerable CDFW_SSC-Species of Special Concern USFS_S-Sensitive</p>	<p>(See habitat description for spring-run chinook, above). The Feather River is a known migration corridor for fall-run chinook salmon.</p>	<p>Direct reliance on groundwater. Chinook salmon are reliant on groundwater-fed rivers to provide adequate water quality, temperature, and volume for upstream migration in the fall before rainfall elevates river flows, as well as for spawning and freshwater residency. Listed as Butte County Beneficial User.</p>	<p>Known to occur in Feather River. Regularly recorded at Feather River Fish Monitoring Station (CalFish 2026).</p>
<p>green sturgeon <i>Acipenser medirostris</i> pop. 1</p>	<p>FT/-</p>	<p>AFS_VU-Vulnerable CDFW_SSC-Species of Special Concern IUCN_EN-Endangered</p>	<p>Spawns in the Sacramento, Feather and Yuba Rivers. Adults spawn in fast, deep water during the first half of the year. Post-spawn adults then move back down the river during the fall and re-enter the ocean.</p>	<p>Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User.</p>	<p>The Feather River is designated as Critical Habitat for green sturgeon.</p>

Common Name Scientific Name	Status Federal/ State	Other Status	Habitat	Reliance on Groundwater ^a	Occurrence Details
Hardhead <i>Mylopharodon conocephalus</i>	-/-	CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern USFS_S-Sensitive	Low to mid-elevation streams in the Sacramento-San Joaquin drainage. Also present in the Russian River. Clear, deep pools with sand-gravel-boulder bottoms and slow water velocity. Not found where exotic centrarchids predominate.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User.	Extant range includes the Wyandotte Subbasin. Considered a resident fish in the Feather River and in the Sacramento River downstream of the Feather River confluence.
Pacific lamprey <i>Entosphenus tridentatus</i>	-/-	AFS_VU-Vulnerable BLM_S-Sensitive CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern USFS_S-Sensitive	Found in Pacific Coast streams north of San Luis Obispo County, however regular runs in Santa Clara River. Size of runs is declining. Swift-current gravel-bottomed areas for spawning with water temps between 12-18 C. Ammocoetes need soft sand or mud.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User.	Extant range includes the Wyandotte Subbasin.
Sacramento hitch <i>Lavinia exilicauda exilicauda</i>	-/-	CDFW_SSC-Species of Special Concern	Inhabit warm, lowland, waters including clear streams, turbid sloughs, lakes and reservoirs. In streams they are generally found in pools or runs among aquatic vegetation, although small individuals will also use riffles.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User.	Extant range includes the Wyandotte Subbasin.

Common Name Scientific Name	Status Federal/ State	Other Status	Habitat	Reliance on Groundwater ^a	Occurrence Details
Sacramento splittail <i>Pogonichthys macrolepidotus</i>	-/-	AFS_VU-Vulnerable CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern	Endemic to the lakes and rivers of the Central Valley, but now largely confined to the Delta, Suisun Bay and associated marshes. Slow moving river sections, dead end sloughs. Requires flooded vegetation for spawning and foraging for young.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User.	Extant range includes the Wyandotte Subbasin. However, species is largely confined to Delta, Suisun Bay and associated marshes.
steelhead - Central Valley DPS <i>Oncorhynchus mykiss irideus</i> <i>pop. 11</i>	FT/-	AFS_TH-Threatened	Populations in the Sacramento and San Joaquin rivers and their tributaries. Require cold water and complex instream habitat during their freshwater juvenile residency. For spawning, all adult salmonids require sufficient flow and suitably cool water temperature for upstream migration to spawning grounds, and streambeds with clean gravel, free of excessive fine sediment deposition to spawn in. Unlike coho and Chinook salmon, some adult steelhead will survive to spawn a second or third time; thus, adequate streamflows are required for post-spawn adult steelhead to migrate downstream during spring.	Direct reliance on groundwater. Steelhead are reliant on rivers and streams that are likely supported by groundwater. Listed as Butte County Beneficial User.	The Feather River is designated as Critical Habitat for Central Valley DPS of steelhead.

Common Name Scientific Name	Status Federal/ State	Other Status	Habitat	Reliance on Groundwater ^a	Occurrence Details
White sturgeon <i>Acipenser transmontanus</i>	-/CCT	AFS_EN-Endangered CDFW_SSC- Species of Special Concern IUCN_VU- Vulnerable	Live in estuaries of large rivers, moving into freshwater to spawn. Most abundant in brackish portions of estuaries.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User.	Extant range includes the Wyandotte Subbasin. Known to migrate, spawn, and rear in the Feather River.
valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	FT/-	-	Occurs only in the Central Valley of California, in association with blue elderberry (<i>Sambucus mexicana</i>).	May be indirectly reliant on groundwater. Dependent on elderberry shrubs for all stages of their lifecycle and is generally associated with riparian habitats.	Records for this species within the Subbasin are located along the Feather River, North Honcut Creek, South Honcut Creek, and Wilson Creek.

Common Name Scientific Name	Status Federal/ State	Other Status	Habitat	Reliance on Groundwater ^a	Occurrence Details
giant gartersnake <i>Thamnophis gigas</i>	FT/CT	IUCN_VU-Vulnerable	Prefers freshwater marsh and low gradient streams. Has adapted to drainage canals and irrigation ditches. This snake is highly aquatic and needs open water for foraging on fish and frogs, wetland plants for cover, and vegetated banks close to the water for basking in the sun.	Reliance on groundwater is direct and indirect. Giant garter snakes rely on groundwater-supported summer wetlands and groundwater-dependent vegetation. However, will utilize anthropogenic water sources, such as drainage canals and water ditches. Listed as Butte County Beneficial User.	There is one CNDDDB record of this species within the Subbasin boundary, located on the northwest side of the Feather River on the north side of Thermalito Afterbay outlet (rm59). Another nearby occurrence was also recorded at a boat launch at Thermalito Afterbay, just outside the subbasin boundary. Numerous other records are located to the west of the Subbasin.
northwestern pond turtle <i>Actinemys marmorata</i>	FPT/-	BLM_S-Sensitive CDFW_SSC-Species of Special Concern IUCN_VU-Vulnerable USFS_S-Sensitive	A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation, below 6000 ft elevation.	Reliance on groundwater is direct and indirect. This species will utilize both surface and groundwater fed systems, with include both natural and anthropogenic water sources. Listed as Butte County Beneficial User.	CNDDDB records within the vicinity of the Subbasin are located in pond and slough habitats.

^a TNC provides lists of freshwater species located within each groundwater basin in California, generated from the [California Freshwater Species Database](https://www.californiafreshwaterspeciesdatabase.org/), that can be used to better evaluate the impacts of groundwater management on environmental beneficial users of surface water in groundwater sustainability plans. Lists and additional information are available at <https://www.groundwaterresourcehub.org/where-we-work/california/beneficial-users/>. This section identifies species that are included on the list generated for Butte County.

KEY TO STATUS CODES:

Federal

Delisted = FD

Proposed Threatened = FPT

Threatened = FT

None = -

State

Candidate Threatened = CCT

Delisted = CD

Endangered = CE

Threatened = CT

None = -

Other

CNPS Rank Categories:

1B = Plants Rare, Threatened, or Endangered in California and elsewhere

CNPS Code Extensions:

.2 = Fairly endangered in California (20U+002d80% occurrences threatened)

The Wyandotte Creek Groundwater Subbasin Groundwater Dependent Ecosystem Analysis conducted by ESA (ESA, 2026) indicated that likely GDEs within the Wyandotte Creek Subbasin are concentrated along the Feather River, Honcut Creek, and the lowland valley portions of Wyman Ravine and Wyandotte Creek. These GDEs consist primarily of riverine surface waters, riparian woodlands and associated emergent and forested wetlands. Such habitats support a combination of trees, shrubs, and/or other perennial plants, and provide food, water, migration and dispersal corridors, breeding sites, and thermal cover for many resident and migratory wildlife species. Wooded stream edges serve as nesting sites and escape habitat for many species. Foliage, bark, and ground substrates provide a variety of foraging areas.

Most of the special-status species identified in Table 1 occupy riverine and riparian habitats. The majority of CNDDDB occurrence records within the Subbasin are concentrated along the Feather River corridor. Species with particularly strong reliance on groundwater-supported aquatic systems include Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley DPS steelhead (*Oncorhynchus mykiss irideus*), green sturgeon (*Acipenser medirostris*), giant gartersnake (*Thamnophis gigas*), northwestern pond turtle (*Actinemys marmorata*), California black rail (*Laterallus jamaicensis coturniculus*), as well as several other non-listed fish species. Although there are no documented California black rail records within the Subbasin boundary, Sierra foothills populations occur immediately north and southeast of the Subbasin, and the species has potential to occupy freshwater marsh wetlands within the Subbasin.

Giant garter snake and northwestern pond turtle may also utilize anthropogenic aquatic features such as irrigation canals, drainage ditches, and sloughs. Other special-status species that may utilize but are not strongly dependent on groundwater dependent ecosystems within the Subbasin include Sanford's arrowhead, northern harrier (*Circus hudsonius*), white-tailed kite (*Elanus leucurus*), Townsend's big-eared bat (*Corynorhinus townsendii*), western mastiff bat (*Eumops perotis californicus*), and silver-haired bat (*Lasionycteris noctivagans*). These species may forage in riparian or wetland habitats but are not considered groundwater dependent.

Several special-status species evaluated, as described in Appendix A, are associated exclusively or primarily with vernal pool grassland habitats. These species are not included in Table 1 because vernal pools within the Subbasin are not likely GDEs under the SGMA.

Vernal pools are seasonal wetlands that pond water due to shallow restrictive layers, such as hardpan or clay soils, typically within six feet of the ground surface. These systems are supported by perched water rather than regional groundwater aquifers. Under SGMA, groundwater dependent ecosystems are defined as ecological communities that rely on regional groundwater, rather than perched aquifers. Landscape mapping within the Subbasin indicates that areas likely to support vernal pools are strongly correlated with soils containing shallow restrictive layers (ESA, 2026).

Special-status species associated with vernal pool habitats within the Subbasin include plants such as Ahart's dwarf rush (*Juncus leiospermus* var. *ahartii*), Ahart's paronychia (*Paronychia ahartii*), slender Orcutt grass (*Orcuttia tenuis*), and wildlife such as California linderiella (*Linderiella occidentalis*), vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp (*Lepidurus packardii*), and western spadefoot (*Spea hammondi*). Because these species rely on seasonal vernal pools rather than groundwater

supported features, they are not expected to be directly affected by groundwater management actions implemented under SGMA.

Critical Habitat

Designated critical habitat occurs within and adjacent to the Subbasin (**Figure 3**). The Feather River is critical habitat, designated under the ESA by NOAA Fisheries, for Central Valley spring-run Chinook salmon, Central Valley DPS steelhead, and green sturgeon (NMFS 2026). Critical habitat for vernal pool species, including Butte County meadowfoam (*Limnanthes floccosa* ssp. *californica*) and vernal pool tadpole shrimp (*Lepidurus packardi*), intersects the northwestern corner of the Subbasin (USFWS 2026). The Feather River corridor represents the primary concentration of designated aquatic critical habitat within the Subbasin and overlaps extensively with mapped groundwater dependent ecosystems (GDEs).

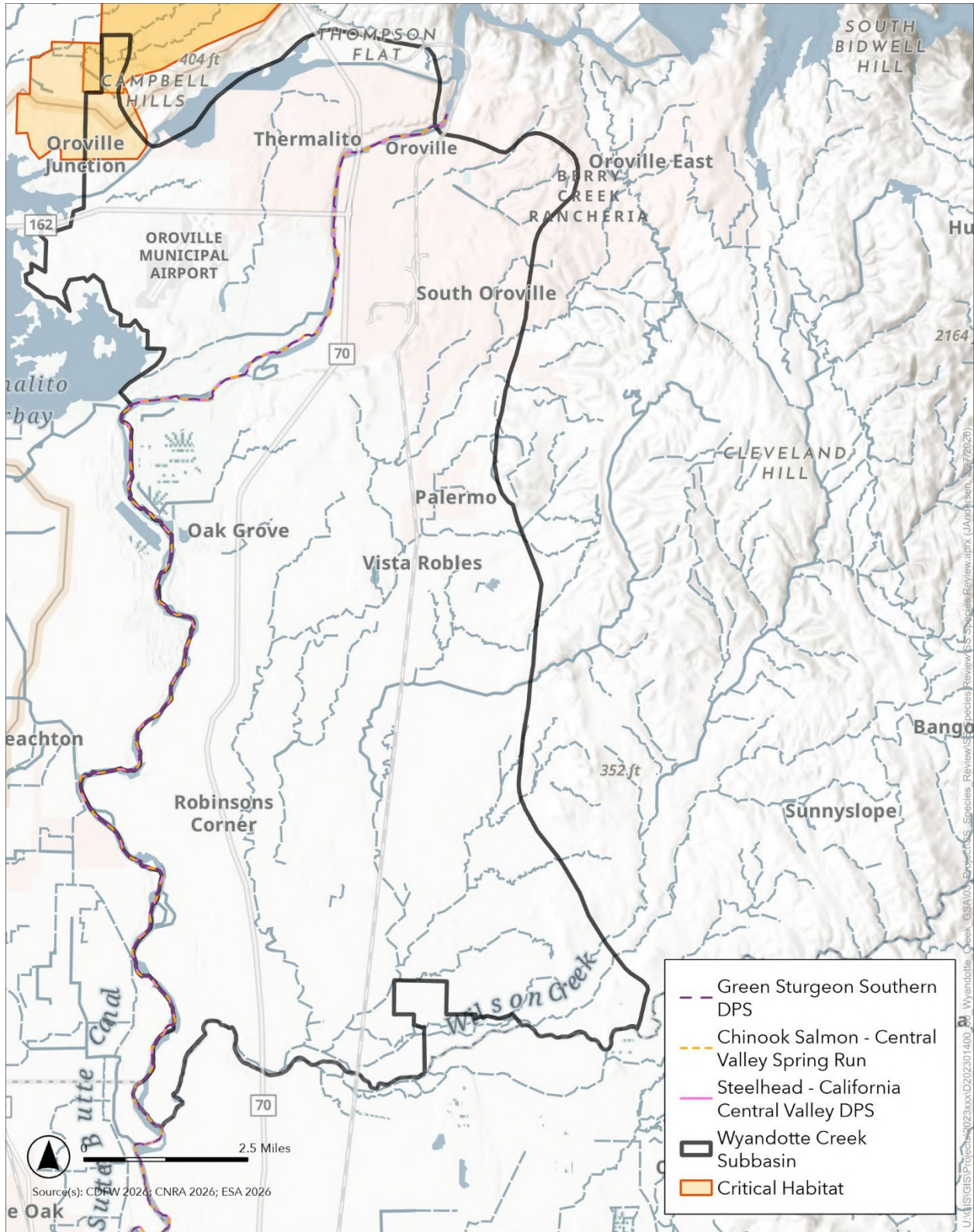


Figure 3. Map of designated critical habitat within the Wyandotte Subbasin.

Field Survey Results

Field surveys proceeded over the course of one day and investigated 25 potential monitoring site locations in the vicinity of Honcut and Robinsons Corner. Twelve sites (1, 2, 3, 10, 17, 18, 19, 20, 21, 22, 23 and 24) were determined to have high monitoring value due to their ease of access and presence of deep-rooted vegetation that indicates a likely groundwater connection. Seven sites (4, 5, 6, 13, 14, 16, and 25) were determined to have marginal monitoring value due to access restrictions or small/irregular patches of appropriate vegetation. Six sites (7, 8, 9, 11, 12, and 15) were determined to be of no quality for monitoring due to inappropriate vegetation or access issues. Results are presented below in **Table 2**, and the locations are presented in **Figure 4**.

TABLE 2
POTENTIAL MONITORING SITES FOR GROUNDWATER DEPENDENT ECOSYSTEMS







Site Number	Access Restrictions	Access Notes	Site Notes	Site Photo
1	None	South side of road	Alnus and Salix dominated riparian. Use upland areas not fed directly by waterway.	
2	None	North side of road	Good mix of herbaceous understory/woody overstory	
3	Railroad	Need permission to access right-of-way	Potential diverse woodland site	

TABLE 2
POTENTIAL MONITORING SITES FOR GROUNDWATER DEPENDENT ECOSYSTEMS

Site Number	Access Restrictions	Access Notes	Site Notes	Site Photo
4	None	Likely on private farmland near road. South of road. Barbwire fence.	Oak overstory, non-native herbaceous understory. Marginal quality.	
5	None	South side of road	Almond orchard nearby; flood irrigation may influence groundwater conditions. Marginal quality.	
6	None	South side of road, easy foot access	Oak overstory, non-native herbaceous understory. Marginal quality.	
7	Private Rd	Homer Ln is private	Wooded area seems like it would be a good site from afar; couldn't get close enough to check.	No photo due to limited access.
9	Private Rd	Homer Ln is private; this point checked another potential access route.	Wooded area seems like it would be a good site from afar; couldn't get close enough to check.	No photo due to limited access.

**TABLE 2
POTENTIAL MONITORING SITES FOR GROUNDWATER DEPENDENT ECOSYSTEMS**







Site Number	Access Restrictions	Access Notes	Site Notes	Site Photo
10	None	Bisected by barbwire fence	Oak overstory, non-native herbaceous understory. Good quality.	
11	Yes	No foot access	Not a good site due to vegetation and landform – herbaceous/drainage ditch.	
12	Yes	No foot access	Vegetation not suitable.	No photo due to limited access.
13	Yes	Many "No Trespassing" signs	Marginal monitoring value, thin strip of trees.	
14	Yes	Flooded	Marginal monitoring value, thin strip of trees.	




TABLE 2
POTENTIAL MONITORING SITES FOR GROUNDWATER DEPENDENT ECOSYSTEMS

Site Number	Access Restrictions	Access Notes	Site Notes	Site Photo
15	None	Roadside	Vegetation not appropriate.	
16	Yes	Some private land	Marginal quality, thin strip of trees.	
17	None	May be wet/flooded	Dense willows may make direct access difficult. Vegetation mapping changed from grassland to willows.	
18	None	Roadside, may be flooded after rain.	Vegetation mapping changed from grassland to oak woodland. Dense woody overstory, good potential site.	

**TABLE 2
POTENTIAL MONITORING SITES FOR GROUNDWATER DEPENDENT ECOSYSTEMS**

Site Number	Access Restrictions	Access Notes	Site Notes	Site Photo
19	Yes	Behind barbwire fence	High quality diverse woody overstory.	
20	Yes	Barbwire fence. Ask landowner before access/photos	Moderately dense woody area, could be a good spot for a monitoring site.	No photo due to limited access.
21	Yes	Private land, they granted foot access to scout the site.	Very high quality diverse riparian woodland with room for multiple sites.	
22	Yes	No foot access due to riparian area	Oak overstory, dense Himalayan blackberry understory.	

**TABLE 2
POTENTIAL MONITORING SITES FOR GROUNDWATER DEPENDENT ECOSYSTEMS**

Site Number	Access Restrictions	Access Notes	Site Notes	Site Photo
23	None	Laurel road appears to end, but there is a drivable path up to the levee with a vehicle with decent clearance.	Very high-quality diverse woodland all along the creek.	
24	None		Very high quality diverse and dense riparian forest.	
25	Difficult foot access	Very steep slope would make walking directly in the plot difficult, but plot could be recorded from above.	Marginal site quality on west side of river; very good site quality on east side, but access likely not possible without a boat.	

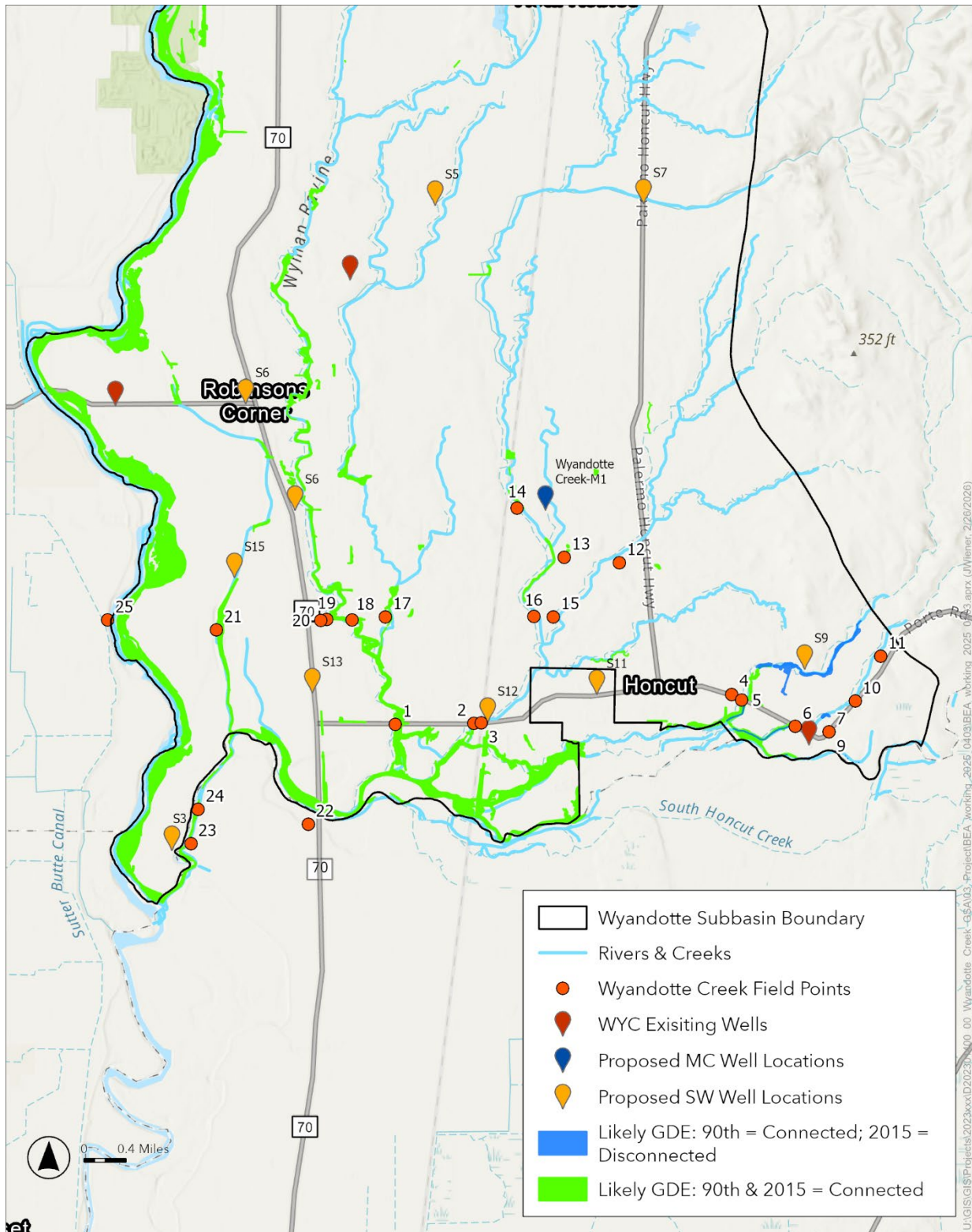


Figure 4. General field survey area covering southern portion of the Subbasin along Feather River, Honcut Creek (north and south), Wyandotte Creek, Wyman Ravine, and unnamed tributaries and survey locations.

Recommendations

Rationale for Long-Term Monitoring

Establishing fixed monitoring locations to assess ecological baseline conditions at representative GDEs and subsequent periodic monitoring at the same monitoring locations can provide insight into how environmental conditions and groundwater management may be influencing GDE function, integrity, and ecological health through time. Availability of rapid survey protocols, such as the California Native Plant Society Relevé protocol (CNPS 2024), provide time-efficient and flexible methods to give well-rounded representations of the condition of local ecosystems. Importantly, ecological monitoring should be coupled with monitoring of nearby groundwater and surface water conditions and statistical analysis would need to be carried out to interpret the relative influence of physical and environmental variables (e.g., climate variables, groundwater levels, surface water applications) on any observed changes in ecological survey metrics. Ground based GDE ecological condition monitoring at fixed monitoring locations can be further coupled with remote sensing methods, such as using the normalized difference vegetation index (NDVI) to evaluate trends in vegetation over time as described in ESA (2026), to provide more comprehensive coverage, especially for areas with widely distributed GDEs.

Representative Sites for Long-Term Monitoring

Various factors can influence selection of GDE sites for long-term monitoring (Rohde et al. 2018) including but not limited to:

- Ecological and hydrologic conditions
- Ability to be representative of regional conditions
- Proximity to existing or planned shallow groundwater monitoring wells
- Land ownership and access limitations due to terrain, private property, fences and other barriers

For this analysis, proximity to existing or planned shallow groundwater monitoring wells and findings from ESA (2026) regarding hydrologic conditions and the classification of GDEs into representative clusters based on a range of ecological, hydrologic, meteorological, and physical attributes were used to identify likely GDEs where establishment of fixed monitoring locations are recommended. Specifically, the ESA (2026) classification exercise yielded six GDE clusters, though only three clusters included GDEs that were identified as likely GDEs based on hydrologic conditions (Classes 1, 2, and 6). For each of these classes a preliminary recommendation is to select six sites per class to establish fixed monitoring locations based on the following criteria:

- Three monitoring sites should have higher frequency of groundwater connection and thus serve as a resilient reference site. Such monitoring sites could be determined from the subset of sites with roots hydraulically connected under both 90th percentile and 2015 conditions (see ESA [2026] for details).
- Three monitoring sites should have lower frequency of groundwater connection and thus serve as a site potentially more sensitive to changing groundwater levels. Such monitoring sites could be

determined from the subset of sites with roots hydraulically connected under 90th percentile conditions but not 2015 conditions.

Figure 5 depicts the six regions with likely GDEs recommended for establishment of fixed monitoring locations based on the criteria above (i.e., three classes with six monitoring sites each). Further analysis, planning, and coordination would be required to progress the selection of representative sites for long-term monitoring.

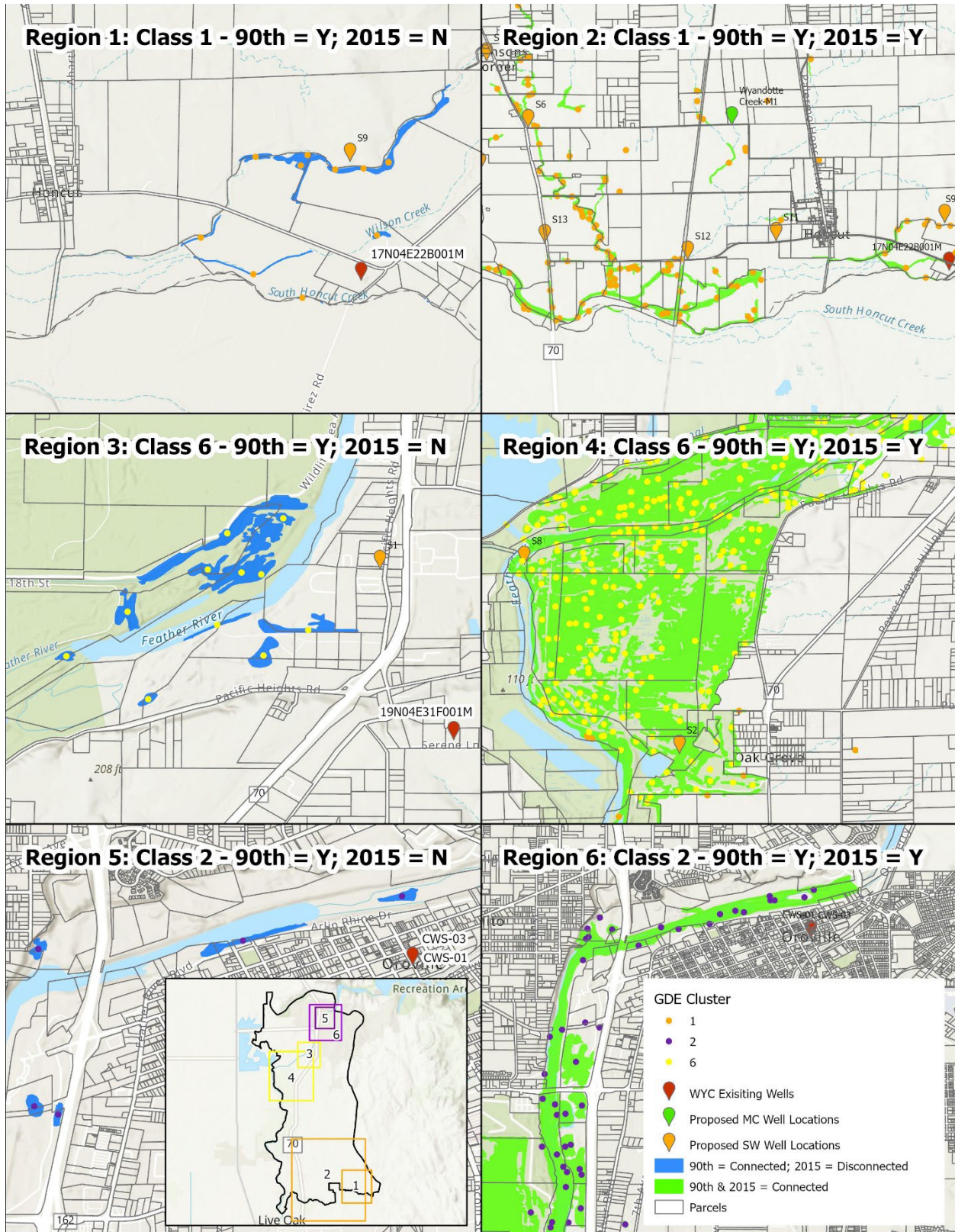


Figure 5. Regions with likely GDEs recommended for establishment of fixed monitoring locations.

Approach for Long-Term Monitoring

The following subsections describe the recommended survey approach.

GDE Ecological Condition Survey Protocol

The recommendation is to follow the Relevé protocol developed by the California Native Plant Society (CNPS 2024), supplemented by method described in Rohde et al. (2019) for tree dominated communities. Broadly, these approaches guide the collection of detailed data on vegetation and abiotic conditions that includes critical baseline data on canopy closure, diversity, regeneration, structural diversity, and ecosystem function (as measured by percentage of native species).

To the extent practicable, permanent (i.e., re-trackable) plots should be set up at each survey location. Plot size and shape are determined based on community-specific recommendations from the CNPS Relevé protocol and local topographic characteristics and vegetation types. For example, the recommended plot size for herbaceous communities is 100 m², and the recommended plot size for tree-dominated riparian vegetation types is 400 m². Plots should be rectangular in shape, with the length and width varying based on stand shape, and not oriented based on cardinal directions. Plots are generally subjectively placed to get a representative sample of the overall GDE. Notably, large GDEs may benefit from multiple monitoring plots established at various locations to capture potential differences in GDE condition within the same local ecosystem. The exact number of survey plots would be determined in accordance with the survey guidelines cited above based on the size of the local conditions of the survey.

Pursuant to the Relevé protocol, data collected should include vegetative cover of all plant species observed and categorized within a vegetation alliance² from the *Manual of California Vegetation* (CNPS 2009), abiotic ground cover (leaf litter, water, bare ground, etc.), number and size class (diameter at breast height; DBH) of trees, and height and age class of shrubs and herbaceous vegetation. Collection of supplemental metrics recommended by Rohde et al. (2019) are described below:

- a. **Canopy cover** should be quantified using a spherical densiometer, with five measurements taken for each permanent plot to get an average total canopy cover. Four individual measurement points should be located at the plot edge for each of the four cardinal directions (north, south, east, and west), and a fifth measurement should be taken at the plot center. Densiometry is a relative value and ranges from 0 to 100%, where higher percentages indicate denser canopy cover and growth.
- b. **Species richness and abundance** should be recorded by documenting every plant species within the permanent plot and their absolute cover. This information can then be used to characterize diversity using the Shannon-Wiener Evenness Index, which is a combined measure of the species richness and the evenness of their abundance in the survey site. A score of 0 indicates only 1 species present, while higher scores indicate more species present. Sites with heavily skewed relative abundance (a few species are far more abundant than others) have lower scores, whereas

² A vegetation alliance is a classification unit that describes recurring patterns of plant communities across the landscape. Each alliance is defined by its characteristic plant species composition and reflects the influence of local climate, soil conditions, hydrology, disturbance regimes, and other environmental factors. California vegetation alliances are described in the *Manual of California Vegetation* (CNPS 2009).

sites with a relatively even distribution of relative abundance have higher scores. High diversity is generally a positive indicator of ecosystem function. Denoted as H , this index is calculated as:

$$H = - \sum_{i=1}^S p_i * \ln p_i$$

, where S is species richness, i is a given species, Σ is the sum of all i species, \ln is the natural log, and p_i is the proportion of individuals of species i .

- c. **Recruitment** is an indicator for forest succession, should be characterized with the number of saplings within each plot (defined as tree individuals either 50–135 cm tall or with diameter at breast height [DBH] <10 cm). At a given time, the presence of saplings usually indicates that recruitment is occurring. Regeneration should be calculated using the following equation:

$$R_i = \frac{Sap_i}{Sap_i + YT_i + MT_i}$$

, where for each plot i , R is Recruitment, Sap is the number of saplings, YT is the number of young trees (defined as DBH 10–25 cm), and MT is the number of mature trees (DBH >25 cm). As the equation indicates, regeneration is a relative value that ranges between 0 and 100%, where higher percentages indicate greater recruitment rate. Tree recruitment is an indicator of the ability of tree species to successfully reproduce. This indicator can track whether changes in groundwater availability are impacting the long-term sustainability of a forest stand by assessing the age distribution of trees and whether damaged or dead trees can be naturally replaced.

- d. **Structure** should be characterized by the number of layers (strata) present in the vegetation community when suitable, and is calculated as follows:

$$ES_i = \frac{Strata_i}{Strata_{max}}$$

, where for each plot i , ES is the vegetation structure, $Strata$ is the number of strata, and $Strata_{max}$ is the maximum number of strata for each community. Vegetation $Strata_{max}$ should be estimated based on a simplified version of the California Wildlife Habitat Relationships protocol (CDFW, 1988) or using the methodology from Rohde et al. (2019). Vegetation structure is a relative value that ranges between 0 and 100%, where higher percentages indicate greater vertical structure in the GDE.

- e. **Native plant dominance** should be used as a rough proxy for ecosystem function because it can provide insight on whether the ecosystem's function is intact or any functional change. Although the presence of non-native invasive species may not necessarily alter the functioning of an ecosystem, the presence of native species can at a minimum be indicative that ecosystem function is more likely to be intact. Native plant dominance is calculated as the percent of native plant cover to total plant cover:

$$F_i = \frac{NP_i}{NP_i + IP_i}$$

, where for plot i , F is the ecosystem function, NP is the total cover of native plant species, and IP is the total cover of non-native plant species. F is a relative value that ranges between 0 and 100%, where higher values show relative higher native plant cover and indicate greater ecosystem function for the GDEs.

In addition to vegetation metrics, hydrology information such as presence of surface flow or ponded water, relative water depth should be recorded.

Site Survey Schedule and Frequency

The California water year runs from October 1 to September 30. It is generally recommended that surveys take place toward the end of the dry season, between June and September, when water levels are likely at their seasonal low. This provides the opportunity to assess GDEs at their peak annual water stress, when the extent of groundwater dependence will be evident in the condition of selected monitoring indicators (e.g., vegetation condition, wildlife presence, hydrology, soil saturation). Surveys across multiple monitoring sites should be timed as close together as possible to reduce the potential for confounding variables introduced by weather events.

A period of 5-years is recommended as a preliminary frequency for repeat ecological monitoring at fixed monitoring locations.

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Appendix A. List of All Special-Status Species

**TABLE A.1
SPECIAL-STATUS SPECIES CONSIDERED IN THE WYANDOTTE SUBBASIN**

Organism	Taxonomy	Common Name Scientific Name	Status Federal/ State	CNPS Status	Other Status	Habitat	Reliance on Groundwater ^a and Occurrence Details
Plants	Monocots	adobe-lily <i>Fritillaria pluriflora</i>	-/-	1B.2	BLM_S-Sensitive	Chaparral, cismontane woodland, valley and foothill grassland. Usually on clay soils; sometimes serpentine. 45-945 m.	Not expected to be in habitats mapped as GDEs within the Wyandotte subbasin. Only one historical record within 5 miles of the Subbasin.
		Ahart's dwarf rush <i>Juncus leiospermus</i> var. <i>ahartii</i>	-/-	1B.2	-	Valley and foothill grassland. Restricted to the edges of vernal pools in grassland. 30-100 m.	Not expected to be in habitats mapped as GDEs within the Wyandotte subbasin.
		Butte County fritillary <i>Fritillaria eastwoodiae</i>	-/-	3.2	USFS_S-Sensitive	Chaparral, cismontane woodland, lower montane coniferous forest. Usually on dry slopes but also found in wet places; soils can be serpentine, red clay, or sandy. 4550-1475 m.	Not expected to be in habitats mapped as GDEs within the Wyandotte subbasin.
		Greene's tuctoria <i>Tuctoria greenei</i>	FE/CR	1B.1	-	Vernal pools in open grasslands. 25-1325 m.	Not expected to be in habitats mapped as GDEs within the Wyandotte subbasin.
		Red Bluff dwarf rush <i>Juncus leiospermus</i> var. <i>leiospermus</i>	-/-	1B.1	BLM_S; USFS_S	Chaparral, valley and foothill grassland, cismontane woodland, vernal pools, meadows and seeps. Vernal mesic sites. Sometimes on edges of vernal pools. 30-1255 m.	Not expected to be in habitats mapped as GDEs within the Wyandotte subbasin.
		Sanford's arrowhead <i>Sagittaria sanfordii</i>	-/-	1B.2	BLM_S-Sensitive	In standing or slow-moving freshwater ponds, marshes, and ditches. 0-605 m.	Relies on surface water that may be supported by groundwater. Listed as Butte County Beneficial User. Several 2025 Calfora records located in roadside ditch near Perkins Ave, Palermo, CA.

Organism	Taxonomy	Common Name Scientific Name	Status Federal/ State	CNPS Status	Other Status	Habitat	Reliance on Groundwater ^a and Occurrence Details
		slender Orcutt grass <i>Orcuttia tenuis</i>	FT/CE	1B.1	SB_UCBG-UC Botanical Garden at Berkeley	Vernal pools. Often in gravelly substrate. 25-1755 m.	Listed as Butte County Beneficial User. However, this species is found in vernal pool habitat, which is generally not considered primary GDE under SGMA.
	Dicots	Ahart's paronychia <i>Paronychia ahartii</i>	-/-	1B.1	BLM_S-Sensitive	Valley and foothill grassland, vernal pools, cismontane woodland. Restricted to the edges of vernal pools in grassland. 30-100 m.	Not expected to be in habitats mapped as GDEs within the Wyandotte subbasin.
		big-scale balsamroot <i>Balsamorhiza macrolepis</i>	-/-	1B.2	BLM_S; USFS_S	Chaparral, valley and foothill grassland, cismontane woodland. Sometimes on serpentine. 35-1465 m.	Not expected to be in habitats mapped as GDEs within the Wyandotte subbasin.
		Brandegee's clarkia <i>Clarkia biloba</i> ssp. <i>brandegeae</i>	-/-	4.2	SB_UCSC-UC Santa Cruz	Species is found in chaparral, cismontane woodland, and lower montane coniferous forest. Often in roadcuts. 75-915 m.	Not expected to be in habitats mapped as GDEs within the Wyandotte subbasin.
		Butte County golden clover <i>Trifolium jakerstii</i>	-/-	1B.2	BLM_S-Sensitive SB_USDA-US Dept of Agriculture	Valley and foothill grassland, vernal pools. Mesic sites in grassland. 45-400 m.	Not expected to be in habitats mapped as GDEs within the Wyandotte subbasin.
		Butte County meadowfoam <i>Limnanthes floccosa</i> ssp. <i>californica</i>	FE/CE	1B.1	SB_CalBG/RSABG- California/Rancho Santa Ana Botanic Garden	Vernal pools, valley and foothill grassland. Wet or flowing drainages and depressions; often not in discrete vernal pools; soils are usually Redding clay with rocks. 35-370 m.	Not expected to be in habitats mapped as GDEs within the Wyandotte subbasin.
		pink creamsacs <i>Castilleja rubicundula</i> var. <i>rubicundula</i>	-/-	1B.2	BLM_S-Sensitive	Species is found in chaparral, cismontane woodland, meadows and seeps, and valley and foothill grassland. Openings in chaparral or grasslands. On serpentine. 20-915 m.	Not expected to be in habitats mapped as GDEs within the Wyandotte subbasin.

Organism	Taxonomy	Common Name Scientific Name	Status Federal/ State	CNPS Status	Other Status	Habitat	Reliance on Groundwater ^a and Occurrence Details
		spicate calycadenia <i>Calycadenia spicata</i>	-/-	1B.3		Valley and foothill grassland, cismontane woodland. Dry, adobe, clay, gravelly, rocky, disturbed areas, openings, roadsides. 40-1400 m.	Not expected to be in habitats mapped as GDEs within the Wyandotte subbasin.
		woolly rose- mallow <i>Hibiscus lasiocarpus</i> var. <i>occidentalis</i>	-/-	1B.2	BLM_S; SB_CalBG/RSABG; SB_UCBG	Marshes and swamps (freshwater). Moist, freshwater-soaked river banks and low peat islands in sloughs; can also occur on riprap and levees. In California, known from the delta watershed. 0-155 m.	Relies on saturated soils that may be supported by groundwater. Listed as Butte County Beneficial User. Records within 5 miles but not within the Subbasin.
Wildlife	Amphibians	foothill yellow- legged frog - Feather River DPS <i>Rana boyllii</i> pop. 2	PT/CT	-	BLM_S-Sensitive USFS_S-Sensitive	Found in Feather River watershed above Oroville. Specifically, watershed subbasins (HU 8) North Fork Feather, East Branch North Fork Feather, Middle Fork Feather, Butte Creek, and Honcut Headwaters - Lower Feather in Lassen, Plumas, Butte, and Sierra counties. Partly shaded shallow streams and riffles with a rocky substrate in a variety of habitats. Needs at least some cobble-sized substrate for egg-laying and at least 15 weeks to attain metamorphosis.	Direct reliance on groundwater. This species relies on surface water that may be supported by groundwater. Listed as Butte County Beneficial User. Unlikely to occur within Wyandotte Subbasin. The subbasin is near historical range of this species, but all records are located outside of the Subbasin boundary. All but one record (recorded in 1950) within 5 miles of the Subbasin are extirpated.
		western spadefoot <i>Spea hammondii</i>	-/-	-	BLM_S-Sensitive CDFW_SSC- Species of Special Concern IUCN_NT-Near Threatened	Occurs primarily in grassland habitats, but can be found in valley- foothill hardwood woodlands. Vernal pools are essential for breeding and egg-laying.	Not expected to depend on habitats mapped as GDEs within the Wyandotte subbasin.

Organism	Taxonomy	Common Name Scientific Name	Status Federal/ State	CNPS Status	Other Status	Habitat	Reliance on Groundwater ^a and Occurrence Details
Birds		bald eagle <i>Haliaeetus leucocephalus</i>	FD/CE	-	BLM_S-Sensitive CDFW_S-Sensitive CDFW_FP-Fully Protected IUCN_LC-Least Concern USFS_S-Sensitive	Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.	Indirect reliance on groundwater. Bald eagles are reliant on surface water that may be supported by groundwater and/or groundwater-dependent vegetation. This species often roosts and nests along lakes and rivers, where they hunt for fish living in surface water bodies that may be supported by groundwater. Listed as Butte County Beneficial User. Known to nest in the vicinity; a nest is recorded along the riparian corridor of the Feather River within the Subbasin (Occ No. 347).
		bank swallow <i>Riparia riparia</i>	-/CT	-	BLM_S-Sensitive IUCN_LC-Least Concern	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	Indirect reliance on groundwater. This species relies on surface water that may be supported by groundwater. Listed as Butte County Beneficial User. Multiple records of colonies along the Feather River.
		burrowing owl <i>Athene cunicularia</i>	-/-	-	BLM_S-Sensitive CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern USFWS_BCC-Birds of Conservation Concern	Species is found in open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	This species is not dependent on or otherwise a beneficial user of GDEs.

Organism	Taxonomy	Common Name Scientific Name	Status Federal/ State	CNPS Status	Other Status	Habitat	Reliance on Groundwater ^a and Occurrence Details
		California black rail <i>Laterallus jamaicensis coturniculus</i>	-/CT	-	BLM_S-Sensitive CDFW_FP-Fully Protected IUCN_EN-Endangered NABCI_RWL-Red Watch List	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year and dense vegetation for nesting habitat.	Direct reliance on groundwater. The California black rail is reliant on groundwater-fed wetlands and marshes. It is found in areas with saturated soils and salt marshes, and where the groundwater table is at or above the land surface. Listed as Butte County Beneficial User. While there are no records documented within the Subbasin boundary, Sierra foothills populations of this species are known to occur immediately outside of the north and southeast Subbasin boundary and have potential to occur in wetlands within the Subbasin.
		greater sandhill crane <i>Antigone canadensis tabida</i>	-/CT	-	BLM_S-Sensitive CDFW_FP-Fully Protected USFWS_S-Sensitive	Species nests in wetland habitats in northeastern California, and winters in the Central Valley. Prefers grain fields within 4 miles of a shallow body of water used as a communal roost site; irrigated pasture used as loafing sites.	Direct reliance on groundwater. This species is reliant on freshwater wetlands that may be supported by groundwater for breeding, roosting, and foraging habitat. However, all records are outside of Subbasin boundary.
		northern harrier <i>Circus hudsonius</i>	-/-	-	CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern USFWS_BCC-Birds of Conservation Concern	Species is found in coastal salt and freshwater marsh. Species nests and forages in grasslands, from salt grass in desert sink to mountain cienagas. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	This species may utilize but is not dependent on GDEs.

Organism	Taxonomy	Common Name Scientific Name	Status Federal/ State	CNPS Status	Other Status	Habitat	Reliance on Groundwater ^a and Occurrence Details
		Swainson's hawk <i>Buteo swainsoni</i>	-/CT	-	BLM_S-Sensitive IUCN_LC-Least Concern	Species breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, and agricultural or ranch lands with groves or lines of trees. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations. Swainson's hawk nesting trees in the Central Valley commonly include <i>Populus fremontii</i> (cottonwood), <i>Quercus</i> spp. (oak), <i>Salix</i> spp. (willow), <i>Platanus racemosa</i> (sycamore), <i>Juglans</i> spp. (walnut), and <i>Eucalyptus</i> spp. (eucalyptus).	Indirect reliance on groundwater. Swainson's hawks often rely on groundwater-dependent vegetation in riparian woodland areas for nesting. Nest sites within the Subbasin include riparian trees along the Feather River and Honcutt Creek. Nests have also been recorded in cottonwood and eucalyptus trees present within habitat dominated by vernal pool grasslands.
		tricolored blackbird <i>Agelaius tricolor</i>	-/CT	-	BLM_S-Sensitive CDFW_SSC-Species of Special Concern IUCN_EN-Endangered NABCI_RWL-Red Watch List USFWS_BCC-Birds of Conservation Concern	Species is mostly colonial and most numerous in Central Valley and vicinity. This species uses semipermanent and permanent wetlands with dense tracts of tall emergent vegetation for nesting, and upland habitat for both nesting and foraging. Upland nesting habitat includes groundwater-dependent grain crops (primarily silage associated with dairies). Foraging habitat includes groundwater-dependent crops and irrigated pasture.	Direct reliance on groundwater. Tricolored blackbirds have historically relied on emergent vegetation for breeding and roosting in groundwater-dependent wetlands, particularly semi-permanent wetlands. Irrigated pasture and some groundwater-dependent crops (especially alfalfa) provide extremely important foraging habitat for breeding colonies of this species. However, upland plants such as mustard and thistle may also be used for nesting, and in some areas, tricolored blackbirds will nest in agricultural stands of triticale or other grains. Listed as Butte County Beneficial User. Records within the Subbasin describe tricolored blackbird colonies in blackberry brambles and willow trees.

Organism	Taxonomy	Common Name Scientific Name	Status Federal/ State	CNPS Status	Other Status	Habitat	Reliance on Groundwater ^a and Occurrence Details
		yellow-breasted chat <i>Icteria virens</i>	-/-	-	CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern	Summer resident; inhabits riparian thickets of willow and other brushy tangles near watercourses. Nests in low, dense riparian, consisting of willow, blackberry, wild grape; forages and nests within 10 ft of ground.	May be indirectly reliant on groundwater. Typically nests in riparian vegetation which may occur in GDEs. Listed as Butte County Beneficial User. Multiple eBird records throughout Subbasin. Concentrations of records include areas along Feather River and Honcut Creek.
		White-tailed kite <i>Elanus leucurus</i>	-/-	-	BLM_S-Sensitive CDFW_FP-Fully Protected IUCN_LC-Least Concern	Rolling foothills and valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	This species may utilize but is not dependent on GDEs.
	Crustaceans	California linderiella <i>Linderiella occidentalis</i>	-/-	-	IUCN_NT-Near Threatened	Seasonal pools in unplowed grasslands with old alluvial soils underlain by hardpan or in sandstone depressions.	Listed as Butte County Beneficial User. However, this species is found in vernal pool and other surface water generated habitats, which are generally not considered primary GDEs under SGMA.
		vernal pool fairy shrimp <i>Branchinecta lynchi</i>	FT/-	-	IUCN_VU-Vulnerable	Species is endemic to the grasslands of the Central Valley, Central Coast mountains, and South Coast mountains, in astatic rain-filled pools.	Listed as Butte County Beneficial User. However, this species is found in vernal pool and other surface water generated habitats, which are generally not considered primary GDEs under SGMA.
		vernal pool tadpole shrimp <i>Lepidurus packardi</i>	FE/-	-	IUCN_EN-Endangered	Inhabits vernal pools and swales in the Sacramento Valley containing clear to highly turbid water.	Listed as Butte County Beneficial User. However, this species is found in vernal pool and other surface water generated habitats, which are generally not considered primary GDEs under SGMA.

Organism	Taxonomy	Common Name Scientific Name	Status Federal/ State	CNPS Status	Other Status	Habitat	Reliance on Groundwater ^a and Occurrence Details
	Fish	central California roach <i>Hesperoleucus symmetricus symmetricus</i>	-/-	-	CDFW_SSC-Species of Special Concern	streams of the Sierra Nevada foothills flowing into the Central Valley and are particularly well adapted to life in intermittent watercourses; dense populations are frequently observed in isolated pools. Rarely above 1,000 meters in elevation. Tolerant of wide temperature ranges and dissolved oxygen levels. Most abundant when only species present, occupying large pools in open water. With other fish, found in shallow margins, pool edges, or dense cover.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User. Extant range includes the Wyandotte Subbasin.
		chinook salmon - Central Valley spring-run ESU <i>Oncorhynchus tshawytscha</i> pop. 11	FT/CT	-	AFS_TH-Threatened	Adult Chinook spawn in larger rivers and streams, where they require sufficient flows for migration and largely sediment-free gravel for spawning. Juveniles need deep pools, cool temperatures in warm months, and areas of refuge from high water velocities during the wet season (e.g., floodplains, backwaters, etc.). Water quality, including temperature and dissolved oxygen, is important for juveniles living in estuaries. Groundwater augmentation into streams provides important cold-water refugia, particularly for winter- and spring-run juveniles in the Central Valley and foothills during hot, dry summer months. The Feather River is a known migration corridor for spring-run chinook salmon.	Direct reliance on groundwater. Chinook salmon are reliant on groundwater-fed rivers to provide adequate water quality, temperature, and volume for upstream migration in the fall before rainfall elevates river flows, as well as for spawning and freshwater residency. Listed as Butte County Beneficial User. The Feather River is designated as Essential Habitat for Chinook Salmon and Critical Habitat for Central Valley spring-run Chinook salmon

Organism	Taxonomy	Common Name Scientific Name	Status Federal/ State	CNPS Status	Other Status	Habitat	Reliance on Groundwater ^a and Occurrence Details
		chinook salmon - Central Valley fall / late fall-run ESU <i>Oncorhynchus tshawytscha</i> pop. 13	-/-	-	AFS_VU-Vulnerable CDFW_SSC-Species of Special Concern USFS_S-Sensitive	(See habitat description for spring-run chinook, above). The Feather River is a known migration corridor for fall-run chinook salmon.	Direct reliance on groundwater. Chinook salmon are reliant on groundwater-fed rivers to provide adequate water quality, temperature, and volume for upstream migration in the fall before rainfall elevates river flows, as well as for spawning and freshwater residency. Listed as Butte County Beneficial User. Known to occur in Feather River. Regularly recorded at Feather River Fish Monitoring Station.
		green sturgeon <i>Acipenser medirostris</i> pop.	FT/-	-	AFS_VU-Vulnerable CDFW_SSC-Species of Special Concern IUCN_EN-Endangered	Spawns in the Sacramento, Feather and Yuba Rivers. Adults spawn in fast, deep water during the first half of the year. Post-spawn adults then move back down the river during the fall and re-enter the ocean.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User. The Feather River is designated as Critical Habitat for green sturgeon.
		Hardhead <i>Mylopharodon conocephalus</i>	-/-	-	CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern USFS_S-Sensitive	Low to mid-elevation streams in the Sacramento-San Joaquin drainage. Also present in the Russian River. Clear, deep pools with sand-gravel-boulder bottoms and slow water velocity. Not found where exotic centrarchids predominate.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User. Extant range includes the Wyandotte Subbasin. Considered a resident fish in the Feather River and in the Sacramento River downstream of the Feather River confluence.
		Pacific lamprey <i>Entosphenus tridentatus</i>	-/-	-	AFS_VU-Vulnerable BLM_S-Sensitive CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern USFS_S-Sensitive	Found in Pacific Coast streams north of San Luis Obispo County, however regular runs in Santa Clara River. Size of runs is declining. Swift-current gravel-bottomed areas for spawning with water temps between 12-18 C. Ammocoetes need soft sand or mud.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User. Extant range includes the Wyandotte Subbasin.

Organism	Taxonomy	Common Name Scientific Name	Status Federal/ State	CNPS Status	Other Status	Habitat	Reliance on Groundwater ^a and Occurrence Details
		Sacramento hitch <i>Lavinia exilicauda exilicauda</i>	-/-	-	CDFW_SSC- Species of Special Concern	Inhabit warm, lowland, waters including clear streams, turbid sloughs, lakes and reservoirs. In streams they are generally found in pools or runs among aquatic vegetation, although small individuals will also use riffles.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User. Extant range includes the Wyandotte Subbasin.
		Sacramento splittail <i>Pogonichthys macrolepidotus</i>	-/-		AFS_VU- Vulnerable CDFW_SSC- Species of Special Concern IUCN_LC-Least Concern	Endemic to the lakes and rivers of the Central Valley, but now largely confined to the Delta, Suisun Bay and associated marshes. Slow moving river sections, dead end sloughs. Requires flooded vegetation for spawning and foraging for young.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User. Extant range includes the Wyandotte Subbasin. However, species is largely confined to Delta, Suisun Bay and associated marshes.
		steelhead - Central Valley DPS <i>Oncorhynchus mykiss irideus pop. 11</i>	FT/-	-	AFS_TH- Threatened	Populations in the Sacramento and San Joaquin rivers and their tributaries. Require cold water and complex instream habitat during their freshwater juvenile residency. For spawning, all adult salmonids require sufficient flow and suitably cool water temperature for upstream migration to spawning grounds, and streambeds with clean gravel, free of excessive fine sediment deposition to spawn in. Unlike coho and Chinook salmon, some adult steelhead will survive to spawn a second or third time; thus, adequate streamflows are required for post-spawn adult steelhead to migrate downstream during spring.	Direct reliance on groundwater. Steelhead are reliant on rivers and streams that are likely supported by groundwater. Listed as Butte County Beneficial User. The Feather River is designated as Critical Habitat for Central Valley DPS of steelhead.
		White sturgeon <i>Acipenser transmontanus</i>	-/CCT	-	AFS_EN- Endangered CDFW_SSC- Species of Special Concern IUCN_VU- Vulnerable	Live in estuaries of large rivers, moving into freshwater to spawn. Most abundant in brackish portions of estuaries.	Direct reliance on groundwater. This species relies on surface water flows that may be supported by groundwater. Listed as Butte County Beneficial User. Extant range includes the Wyandotte Subbasin. Known to migrate, spawn, and rear in the Feather River.

Organism	Taxonomy	Common Name Scientific Name	Status Federal/ State	CNPS Status	Other Status	Habitat	Reliance on Groundwater ^a and Occurrence Details
	Insects	Crotch bumble bee <i>Bombus crotchii</i>	-/-	-	IUCN_EN- Endangered	Species is found from Coastal California east to the Sierra- Cascade crest and south into Mexico.	This species may utilize but is not dependent on GDEs.
		valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	FT/-	-	-	Occurs only in the Central Valley of California, in association with blue elderberry (<i>Sambucus mexicana</i>).	May be indirectly reliant on groundwater. Dependent on elderberry shrubs for all stages of their lifecycle and is generally associated with riparian habitats. Records for this species within the Subbasin are located along the Feather River, North Honcut Creek, South Honcut Creek, and Wilson Creek.
	Mammals	North American porcupine <i>Erethizon dorsatum</i>	-/-	-	IUCN_LC-Least Concern	Forested habitats in the Sierra Nevada, Cascade, and Coast ranges, with scattered observations from forested areas in the Transverse Ranges.	This species may utilize but is not dependent on GDEs.
		silver-haired bat <i>Lasiorycteris noctivagans</i>	-/-	-	IUCN_LC-Least Concern	Primarily a coastal and montane forest dweller, feeding over streams, ponds and open brushy areas.	This species may utilize but is not dependent on GDEs.
		Townsend's big-eared bat <i>Corynorhinus townsendii</i>	-/-	-	BLM_S-Sensitive CDFW_SSC- Species of Special Concern IUCN_LC-Least Concern USFS_S- Sensitive	Species is found throughout California in a wide variety of habitats. Most common in mesic sites.	This species may utilize but is not dependent on GDEs.
		western mastiff bat <i>Eumops perotis californicus</i>	-/-	-	BLM_S-Sensitive CDFW_SSC- Species of Special Concern	Many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, chaparral, etc.	This species may utilize but is not dependent on GDEs.
	Mollusks	western ridged mussel <i>Gonidea angulata</i>	-/-	-	IUCN_VU- Vulnerable	Primarily creeks and rivers and less often lakes. Originally in most of state, now extirpated from Central and Southern California.	Listed as Butte County Beneficial User. However, records within Subbasin are historical.

Organism	Taxonomy	Common Name Scientific Name	Status Federal/ State	CNPS Status	Other Status	Habitat	Reliance on Groundwater ^a and Occurrence Details
	Reptiles	giant gartersnake <i>Thamnophis gigas</i>	FT/CT	-	IUCN_VU-Vulnerable	Prefers freshwater marsh and low gradient streams. Has adapted to drainage canals and irrigation ditches. This snake is highly aquatic and needs open water for foraging on fish and frogs, wetland plants for cover, and vegetated banks close to the water for basking in the sun.	Reliance on groundwater is direct and indirect. Giant garter snakes rely on groundwater-supported summer wetlands and groundwater-dependent vegetation. However, will utilize anthropogenic water sources, such as drainage canals and water ditches. Listed as Butte County Beneficial User. There is one CNDDB record of this species within the Subbasin boundary, located on the northwest side of the Feather River on the north side of Thermalito Afterbay outlet (rm59). Another nearby occurrence was also recorded at a boat launch at Thermalito Afterbay, just outside the subbasin boundary. Numerous other records are located to the west of the Subbasin.
		northwestern pond turtle <i>Actinemys marmorata</i>	FPT/-	-	BLM_S-Sensitive CDFW_SSC-Species of Special Concern IUCN_VU-Vulnerable USFS_S-Sensitive	A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation, below 6000 ft elevation.	Reliance on groundwater is direct and indirect. This species will utilize both surface and groundwater fed systems, with include both natural and anthropogenic water sources. Listed as Butte County Beneficial User. CNDDB records within the vicinity of the Subbasin are located in pond and slough habitats.

^a TNC provides lists of freshwater species located within each groundwater basin in California, generated from the [California Freshwater Species Database](#), that can be used to better evaluate the impacts of groundwater management on environmental beneficial users of surface water in groundwater sustainability plans. Lists and additional information are available at <https://www.groundwaterresourcehub.org/where-we-work/california/beneficial-users/>. This section identifies species that are included on the list generated for Butte County.

KEY TO STATUS CODES:

Federal

Candidate = FC
 Delisted = FD
 Endangered = FE
 None = -
 Proposed Endangered = FPE
 Proposed Threatened = FPT
 Threatened = FT

State

Candidate Endangered = CCE
 Candidate Threatened = CCT
 Delisted = CD
 Endangered = CE
 None = -
 Rare = CR
 Threatened = CT

Other

CNPS Rank Categories:

1A = Plants presumed extirpated in California and either rare or extinct elsewhere
 1B = Plants Rare, Threatened, or Endangered in California and elsewhere
 2A = Plants presumed extirpated in California, but more common elsewhere
 2B = Plants Rare, Threatened, or Endangered in California, but more common elsewhere
 3 = Plants about which more information is needed - A Review List
 4 = Plants of limited distribution - A Watch List

CNPS Code Extensions:

- .1 = Seriously endangered in California (over 80% of occurrences threatened/high degree and immediacy of threat)
- .2 = Fairly endangered in California (20-80% occurrences threatened)
- .3 = Not very endangered in California (less than 20% of occurrences threatened or no current threats known)

Sources: CNPS 2020; USFWS 2020; CDFW 2020
