

Gliabates oregonius in the northern Oregon Cascades is now recognized as an entirely different species, *Carinacauda stormi*. See the following publication:

Leonard, W. P., L. Chichester, C. H. Richart, T. Young. 2011. *Securicauda hermani* and *Carinacauda stormi*, two new genera and species of slug from the Pacific Northwest of the United States (Gastropoda: Stylommatophora: Arionidae), with notes on *Gliabates oregonius* Webb 1959. *Zootaxa* 2746:53-56.

FY2010 ISSSP Report on Two Salamander Slug (*Gliabates oregonius*) Survey Projects :

1. Mollusk and Amphibian Species Purposive Surveys on Salem BLM and Sweet Home/Detroit Rangers Districts of Willamette NF

2. Salamander Slug and Secondary Mollusk and Amphibian Species Purposive Surveys on Willamette and Umpqua NFs

20 October 2010

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In 2008, the salamander slug (*Gliabates oregonius*-GLOR), also known as the axetail slug, was added to the sensitive species list for the Bureau of Land Management and the Forest Service in the Pacific Northwest. This species was first described as *Gliabates oregonia* from specimens collected in north-central Lane County (Webb 1959). The scientific name was subsequently changed to *Gliabates oregonius* by other researchers (Tom Burke personal communication). *Gliabates oregonius* is classified a S1 species endemic to Oregon and confirmed from a handful of locations in the Cascade and Coast Ranges within the Willamette River drainage. This monotypic species has been reportedly associated with conifer and leaf litter in Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*) and vine maple (*Acer circinatum*) forest habitat. Due to its apparent low abundance and association with forest habitat, there is considerable potential for negative impacts from silvicultural activities, such as logging, fuel treatments and prescribed burning. There is a management need to better understand the abundance and distribution of this species.

Following its inclusion on the sensitive species list, the Region 6 (i.e. Oregon and Washington) ISSSP began funding a series of systematic surveys within the known and suspected range of GLOR to better define its abundance and distribution and to collect incidental information on habitat use and detectability. One study completed in FY09 resurveyed previously reported but unconfirmed sites in the upper portion of the Blue River drainage on the McKenzie River Ranger District (RD). This study confirmed these locations and found an apparent abundance of GLOR in this area (Doerr and Young 2009).

Two additional projects conducting purposive surveys for GLOR were funded by the ISSSP. The first project began in FY09 with contract preparation and award with the completion in FY10 of surveyed portions of Salem BLM Cascade Resource Area, along with the western portion of Detroit RD and the northwestern portion of Sweet Home RD on the Willamette National Forest. Only 11 GLOR locations had been previously documented in the Cascade Resource Area from a 2006 purposive survey and none had been confirmed on the Detroit or Sweet Home Ranger Districts when this study began. This project is referred to as BLM-WIL in this report. The second project completed in FY10 surveyed parts of the southwestern Sweet Home RD, the McKenzie RD south of the Blue River area, and the North Umpqua and Cottage Grove RDs of the Umpqua NF. The Umpqua effort also conducted a few surveys on Roseburg BLM District.

GLOR had not been previously confirmed in the subwatersheds selected for survey. This project is referred to as WIL-UMP in this report. This report summarizes the results of these two ISSSP survey projects.

Methods:

The survey protocol followed version 3.0 for terrestrial mollusk surveys (Duncan et al. 2003). Each one-hour survey consisted of two 20-minute intensive searches of conifer needle and deciduous leaf litter plus 20 minutes of walk-about spot searching in likely habitat for a total search time of one hour/10-acre site. The field form for reporting fauna and habitat observation followed standard GEOBOB (BLM) and NRIS Wildlife (FS) forms similar to the FY09 ISSSP Blue River project (Doerr and Young 2009).

The target number of surveys for the BLM-WIL project was 120 one-hour surveys on Salem BLM, 48 one-hour surveys on the Detroit RD, and 72 one-hour surveys on Sweet Home RD. Half of those searches were done in fall 2009. If GLOR was not detected in the fall, the 10-acre site was resurveyed in the spring 2010. If a GLOR detection was made during the fall survey, a new site was surveyed in spring 2010. Additional spot surveys were done at select sites during contract inspections.

The target number of surveys for the WIL-UMP project was 40 one-hour surveys for the Umpqua National Forest and 20 one-hour surveys each for McKenzie River and Sweet Home RDs. For the Willamette National Forest, about half the survey effort was completed in fall 2009 and the remainder was finished in spring 2010. High potential habitat that did not have fall GLOR detections was resurveyed in different 10 acre sites. On the Umpqua NF, 27 sites were surveyed between Nov. 2 and 18, 10 sites were surveyed between April 21 and June 18, and 3 sites at 4000'-5000' elevation were surveyed on July 7.

The survey effort was spread across the project areas. Sites selected were based on proximity to roads and the presence of conifer stands in the western hemlock series dominated by Douglas-fir with a vine maple (*Acer circinatum*) understory. The surveys sampled a variety of stand ages from about 20 years to old growth.

The WIL-UMP project surveys on the Sweet Home and McKenzie River RDs of the Willamette NF were concentrated in the prime elevation range of about 2800'-4200' where GLOR had previously been documented (Doerr and Young 2009) with some sampling at lower elevation stands. The BLM-WIL project sampled sites in a variety of elevations ranging from 1300'-3600' on the Detroit RD and 1800'-4300' elevation on the Sweet Home Ranger District. Surveys on Salem BLM ranged from about 800'-3500' elevation. The Umpqua sites were selected using a preliminary habitat model that was populated with GLOR location data (n=25 sites from 2005-2008) and based on potential habitat variables of elevation, conifer cover, hardwood cover (bigleaf maple, vine maple, and red alder), stand density index, average max annual temperature, average annual precipitation, and average annual humidity. The model was used to identify general survey areas on the Umpqua, which were field reviewed for survey site locations that met specific on-the-ground habitat conditions where GLOR had been found

during previous Willamette NF surveys (Doerr and Young 2009). The most experienced Willamette NF GLOR surveyor (T.Young) spent two days on the Umpqua NF helping crews with surveys (one day on Cottage Grove RD, one day in Rock Creek BLM lands). Umpqua survey site elevations ranged from 1,780 to 5,140 feet (mean = 3,500').

Locations of any other sensitive mollusk species and the Oregon slender salamander (*Batrachoseps wrightorum*-BAWR) were recorded if detected incidentally during these surveys.

*[Note on Taxonomy: There are questions regarding the taxonomy of *Gliabates oregonius* that are currently under review. Specimens collected in these ISSSSP projects have contributed to reevaluating the taxonomy. At the time of this report only the single species of GLOR as reported by Webb (1959) is recognized. In FY10, biologists from the Willamette (TY and JD) twice surveyed the type specimen locality of Alderwood Wayside State Park in Lane County and could not find the species there.]*

Results and Discussion:

We met or exceeded the target sampling effort in all study areas. Combining both ISSSSP projects, 89 individual GLOR were found at 34 sites. This information includes GLOR detected during opportunistic searches. 2010 detections of GLOR and BAWR on Salem BLM lands plus a map showing 2006 detections of GLOR on Salem BLM are attached with this report (Attachment 1). The management area totals were 2 individuals detected at 2 sites on Cascade Resource Area, 5 individuals detected at 2 sites on Detroit RD, 51 individuals detected at 20 sites on Sweet Home RD, 30 individuals detected at 9 sites on McKenzie RD, and 1 individual detected at 1 site on Middle Fork RD. No GLOR were detected at 40 sites surveyed on the Umpqua RD. In addition, GLOR was detected at one site on the Middle Fork RD (Willamette NF) during a quick spot search while surveying the adjacent watershed on the McKenzie River RD. The survey work expanded the documented southern range of the species on the Westside Cascades, provided documentation of the species presence across the western portion of Sweet Home and Detroit RDs, and found new locations on the eastern half of Salem BLM.

8 BAWR at 5 sites on Salem BLM were incidentally detected. No other non-target sensitive mollusks or amphibians were detected in the other survey areas on the Umpqua or Willamette NFs. The special micro-habitats and survey requirement of GLOR (see below) limit the ability to detect other mollusk and amphibian species when conducting surveys primarily for this species. The BLM survey efforts and results have been entered into GEOBOB.

The Forest Service data has been entered into NRIS Wildlife and voucher specimens were collected. Tail tips were clipped from some vouchers specimens and submitted to the University of La Verne, California for genetic analysis. The remaining portion of the slugs were then preserved in 95% ethyl alcohol and submitted to Oregon State Arthropod Collections. In addition, some specimens were preserved and sent to the Carnegie Museum of Natural History in Pittsburgh, PA. The remaining slugs have been kept in captivity by T. Young and are currently under observation to collect biological and reproductive behavior. Three specimens have been successfully kept in captivity for 23 months (November 2008 to October 2010) and over 20 were collected in November 2009. Eggs were documented in February 2009 and March 2010.

The clutch in 2010 contained 12 eggs that were semi-translucent white, oblong and approximately 2 mm long. No hatchlings have been observed to date.

Fall detections were made from November 5 to November 20. Early snowfall greatly shortened the fall mollusk survey period in 2009. This study verified that GLOR could be detected during spring surveys as well. Spring detections were made from April 15 to June 29. By late June much of the habitat was too dry for reliable surveys and GLOR were only be found in localized areas saturated by water seepage. A spot check by T.Young also yielded a summer detection on July 7. GLOR were detected along a Douglas fir log in needle litter-duff under a layer of vine maple leaves adjacent to a small seep.

The fall 2009 detection rate for one-hour protocol searches was 2.4% (n=125 10-acre sites). The detection rate of spring 2010 revisits to 10-acre sites with negative fall results was 2.9% (n=105 sites). All these comparisons exclude surveys on the Umpqua NF where we never had detections.

One surveyor (T.Young) found about 90% of the individual GLOR detected during these two projects despite doing less than one-third the total survey effort. These detections include a number of GLOR found during spot contract inspections of negative sites surveyed to protocol. It is our experience that GLOR are more difficult to find than many other similar-sized slugs. Detection success depends on experience identifying the very specific micro-site conditions (see below), having the litter and soil at a well-saturated condition, the temporal period of soil thawing and freezing (e.g, GLOR can be found at soil temperatures below 4 degrees C and in soil under snow if the soil has recently been warmer), having a very bright headlamp, and slow and careful sorting of the proper needle litter zone among other factors. For this reason, negative results need to be viewed with some caution.

Based on observations made during these surveys, we have developed a description of the species habitat. GLOR were found in conifer stands in the western hemlock series dominated by Douglas-fir with a vine maple (*Acer circinatum*) understory. Areas where vine maple leaves had fallen and formed a cover to hold moisture in a Douglas-fir needle litter/duff layer seemed to be the preferred microhabitat for *Gliabates oregonius*. Places where down wood had created pockets for leaf litter and moisture to collect also seemed to be selected by *Gliabates oregonius*. Most specimens found in 2008 were located in a very moist Douglas-fir needle litter/duff layer approximately 1 inch below the surface, between the current year's needle layer and the compacted layer of previous years, with a vine maple leaf layer on the top.

Key features to detect this species: Western hemlock/Douglas fir stands with vine maple present at an elevation band of approximately 2000-4000 feet. Forest floor should be free of a thick moss layer and search area should concentrate where vine maple leaves collect into depressions or along downed wood (Douglas fir species). Fall surveys should be conducted when rainy season saturates the needle duff layer, approximately November through December or after 5-7 days of continuous rain. Spring surveys should be conducted shortly after snowmelt and near areas where soil moisture is still retained (April through June). This

species may be found outside of the wet season in areas where soil moisture is retained; however, survey efforts should be limited to wet season unless surveyor has a high level of experience.

Gliabates oregonius detections in the previous Blue River study were in stands from 30 years of age to late-successional forests (Doerr and Young 2009). We found a similar range in stand ages where GLOR was detected in this study.

GLOR were previously reported at elevations ranging from about 3000 to 4200 feet elevation (op. cit.). This study recorded GLOR as low as 1800' elevation. On the Detroit RD, the 5 sites with detections were at 2000'-3000' elevation. The new sites on the Sweet Home RD were at 1800'-4200' elevation. The two positive sites on Salem were at 2800' and 3200' elevation. On the McKenzie River RD, GLOR were found at 2500'-4300' elevation. The one GLOR site on the Middle Fork RD was at 3500' elevation.

Literature Cited

Doerr, J., and T. Young. 2009. FY2009 ISSSP surveys for salamander slug [aka axetail slug] (*Gliabates oregonius*) in the Upper Blue River drainage of the McKenzie River Ranger District, Willamette National Forest. Unpublished Report, Interagency Special Status Species Program (USDI Bureau of Land Management and USDA Forest Service), Portland, OR. [accessed 10/1/2010 from <http://www.fs.fed.us/r6/sfpnw/issssp/species-index/fauna-invertebrates.shtml>]

Duncan, N., T. Burke, S. Dowlan, and P. Hohenlohe. 2003. Survey protocol for survey and manage terrestrial mollusk species from the Northwest Forest Plan. Version 3.0. Bureau of Land Management, Roseburg, Oregon.

Webb, G. R. 1959. Two new northwestern slugs, *Udosarx lyrata*, and *Gliabates oregonia*. *Gastropodia* 1(3): 22-23.

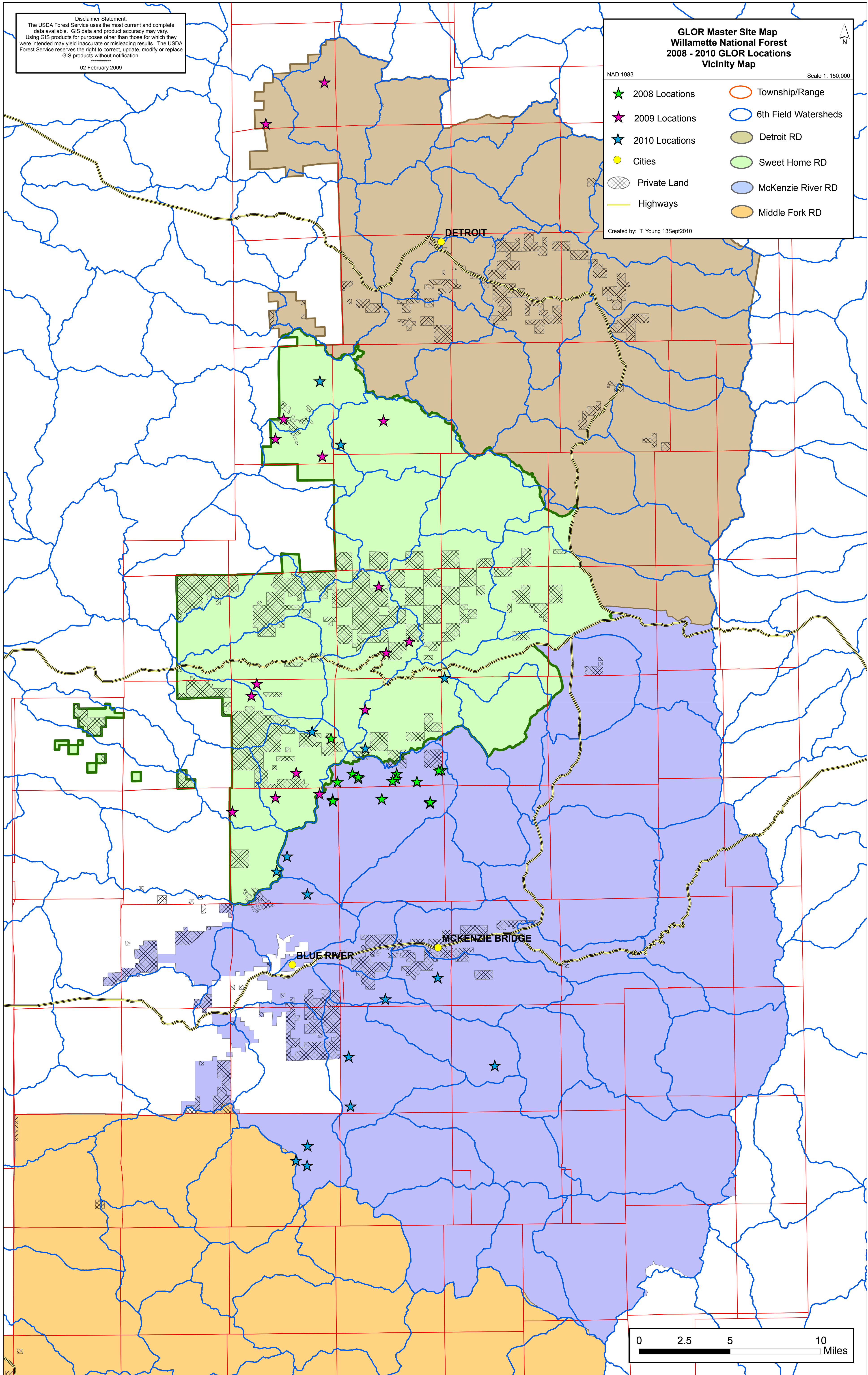
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 02 February 2009

GLOR Master Site Map
Willamette National Forest
2008 - 2010 GLOR Locations
Vicinity Map

NAD 1983 Scale 1: 150,000

★ 2008 Locations	○ Township/Range
★ 2009 Locations	○ 6th Field Watersheds
★ 2010 Locations	○ Detroit RD
● Cities	○ Sweet Home RD
▨ Private Land	○ McKenzie River RD
— Highways	○ Middle Fork RD

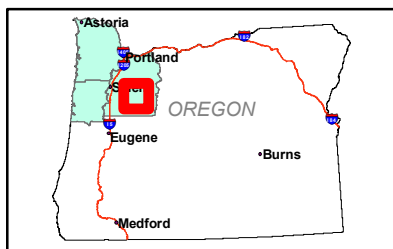
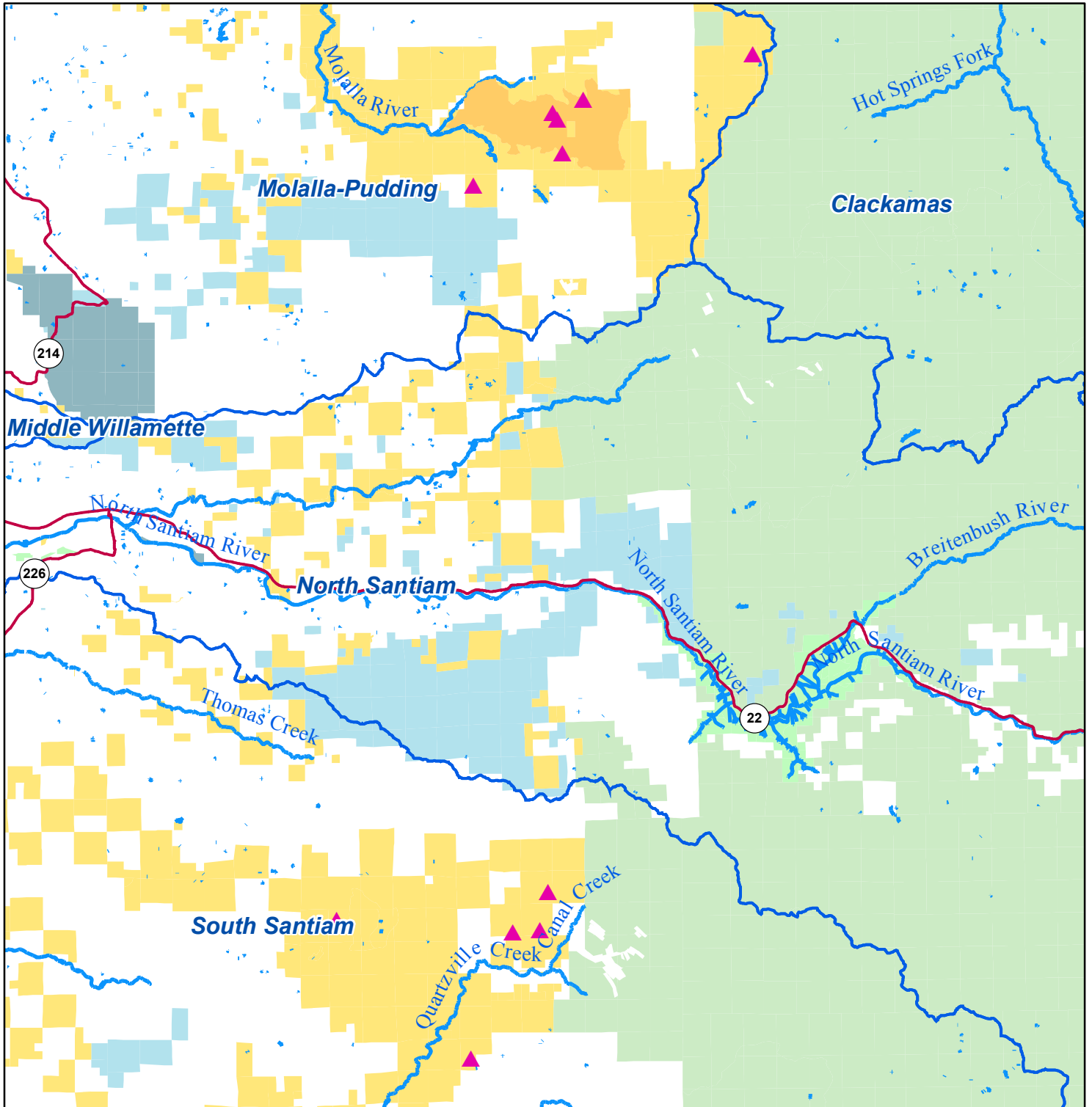
Created by: T. Young 13Sept2010



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Previously Recorded Cascades Resource Area GLOR Sites

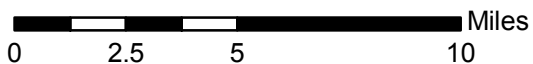


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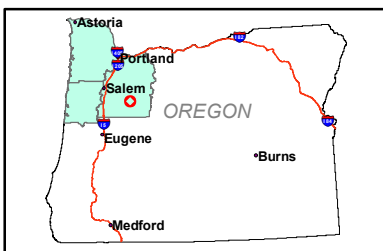
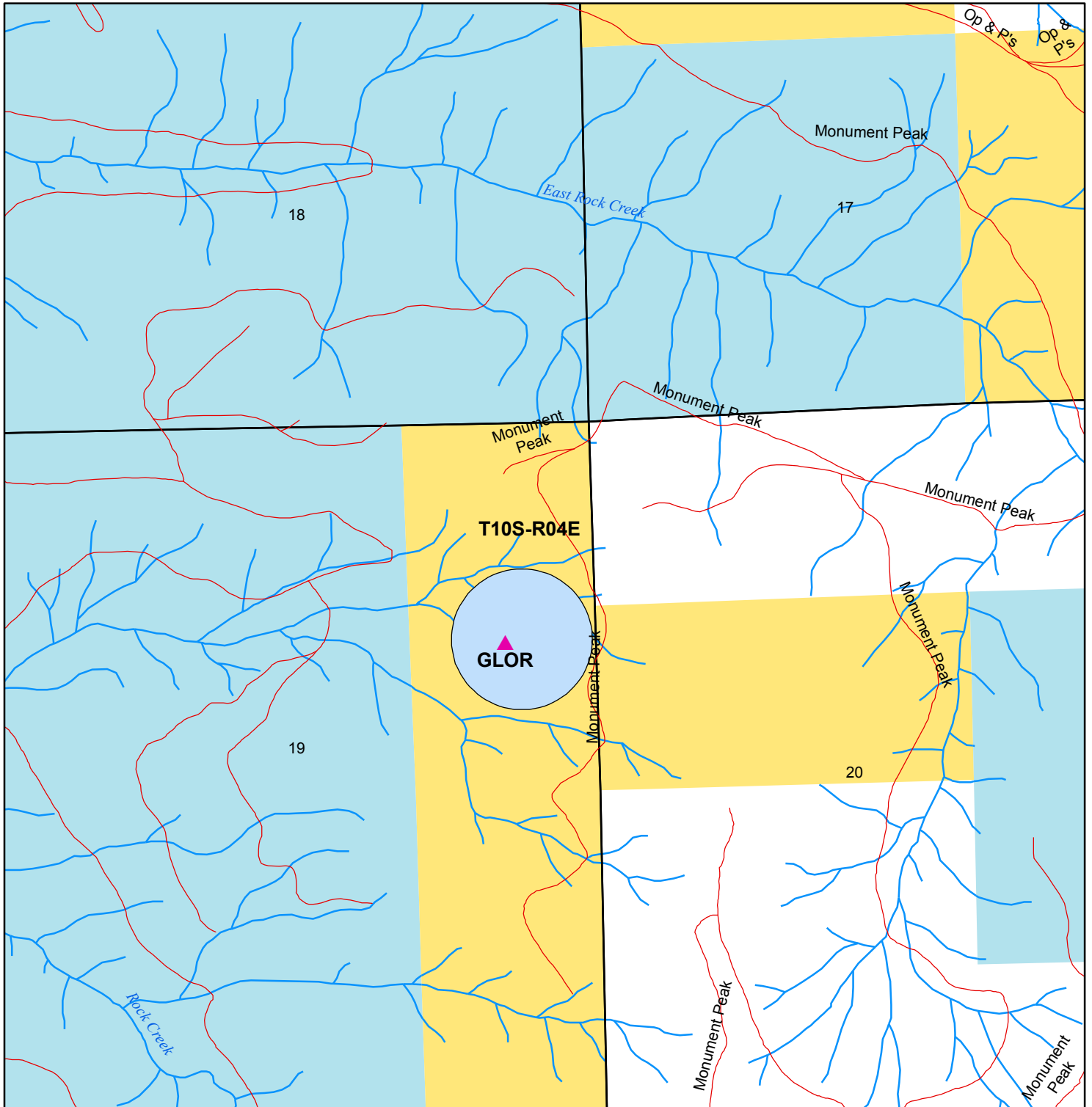
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Subbasins (4th level)	U.S. Forest Service
State Highways	Other Federal
Table Rock Wilderness	State of Oregon
Major Rivers	State Dept. of Parks and Recreation



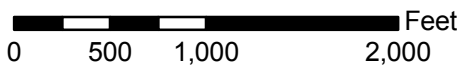
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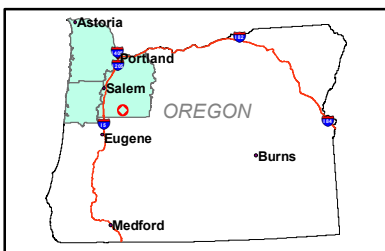
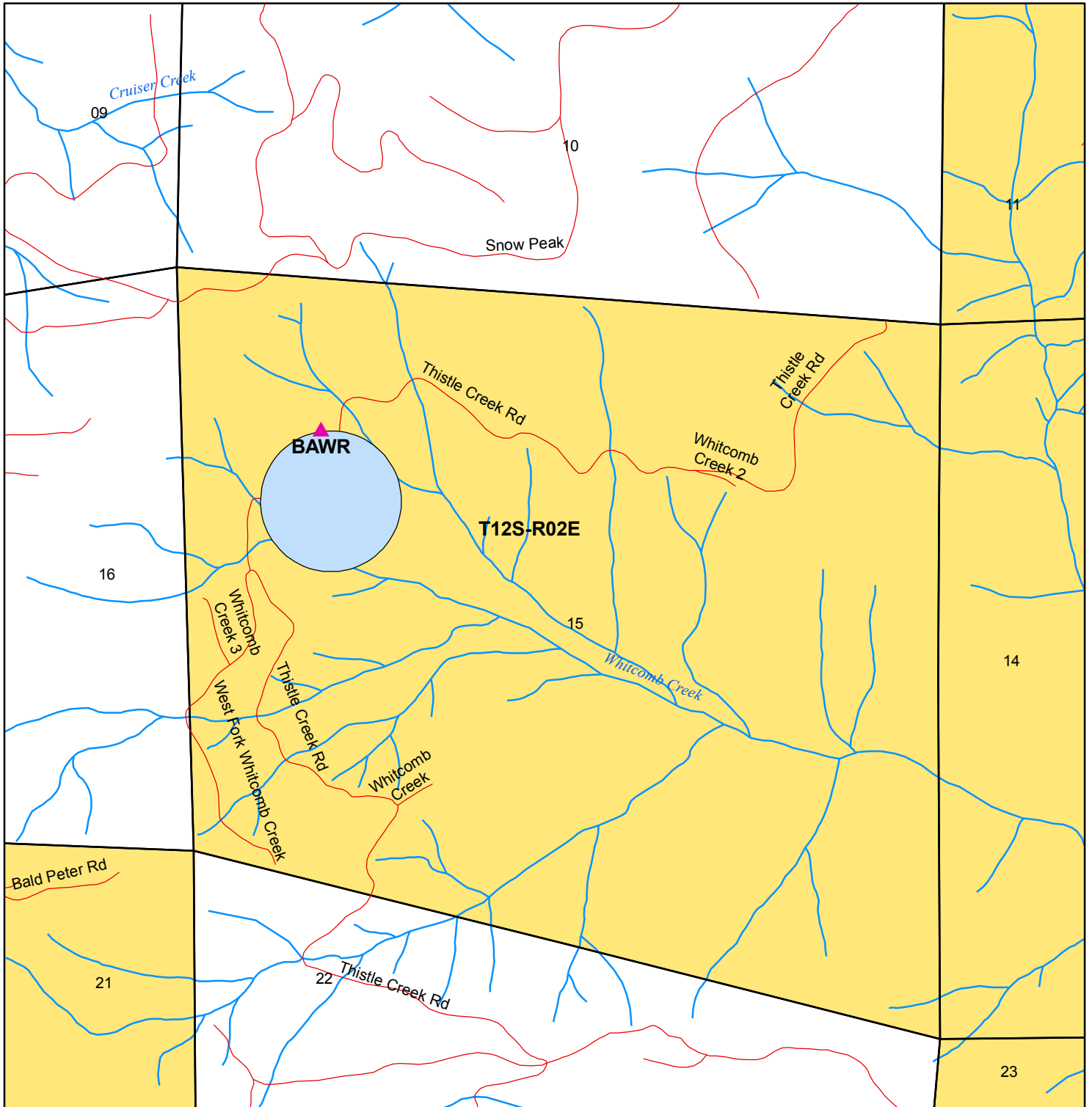


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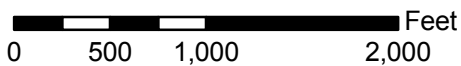


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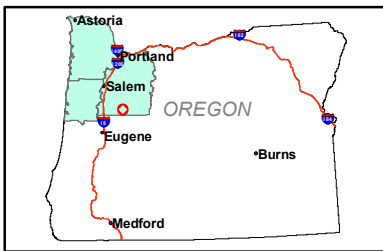
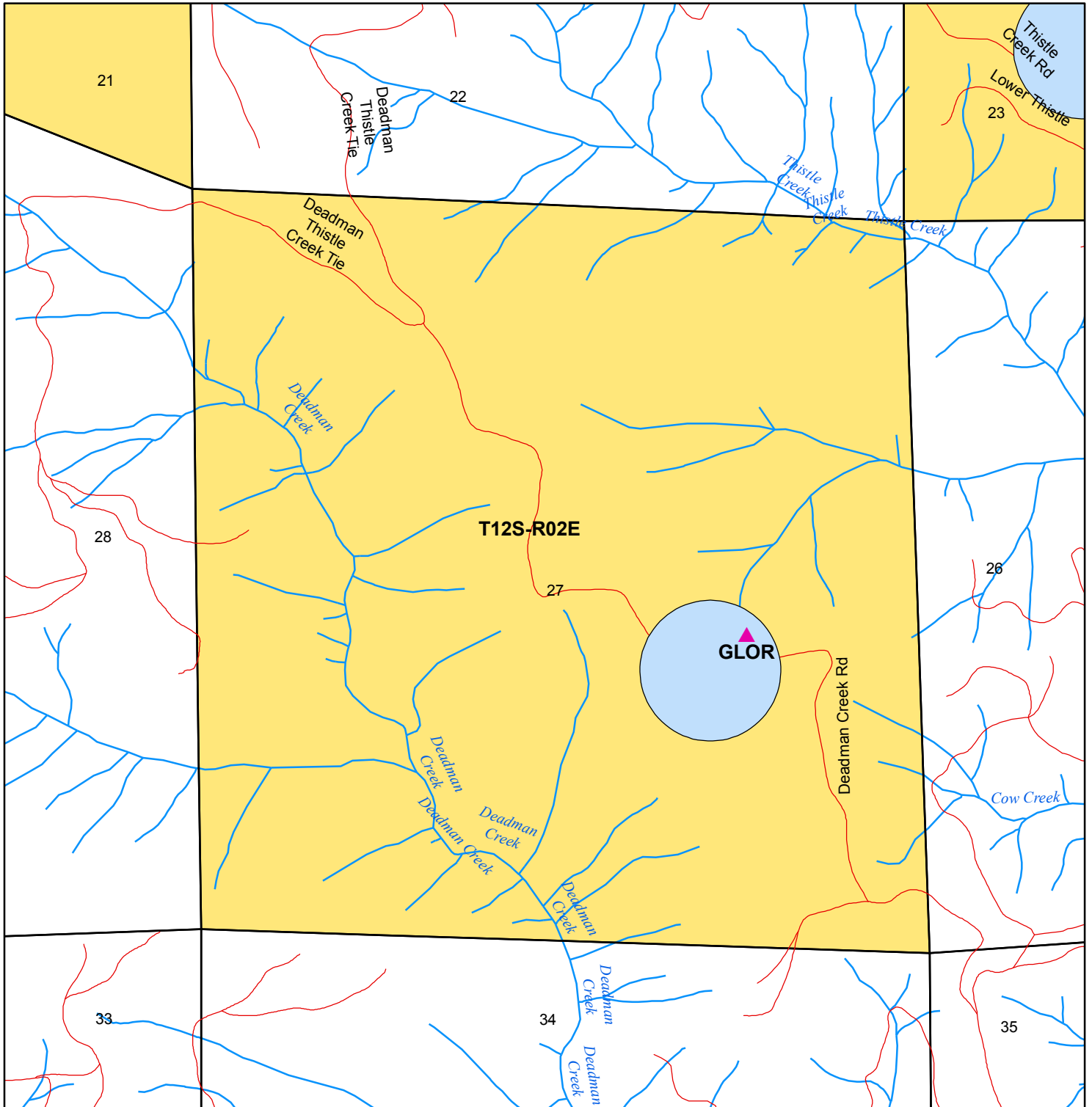


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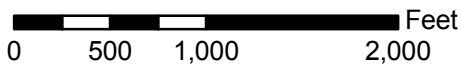


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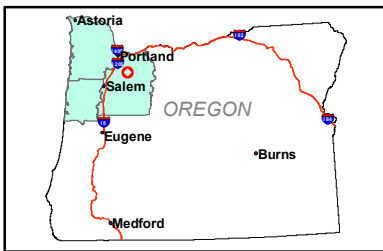
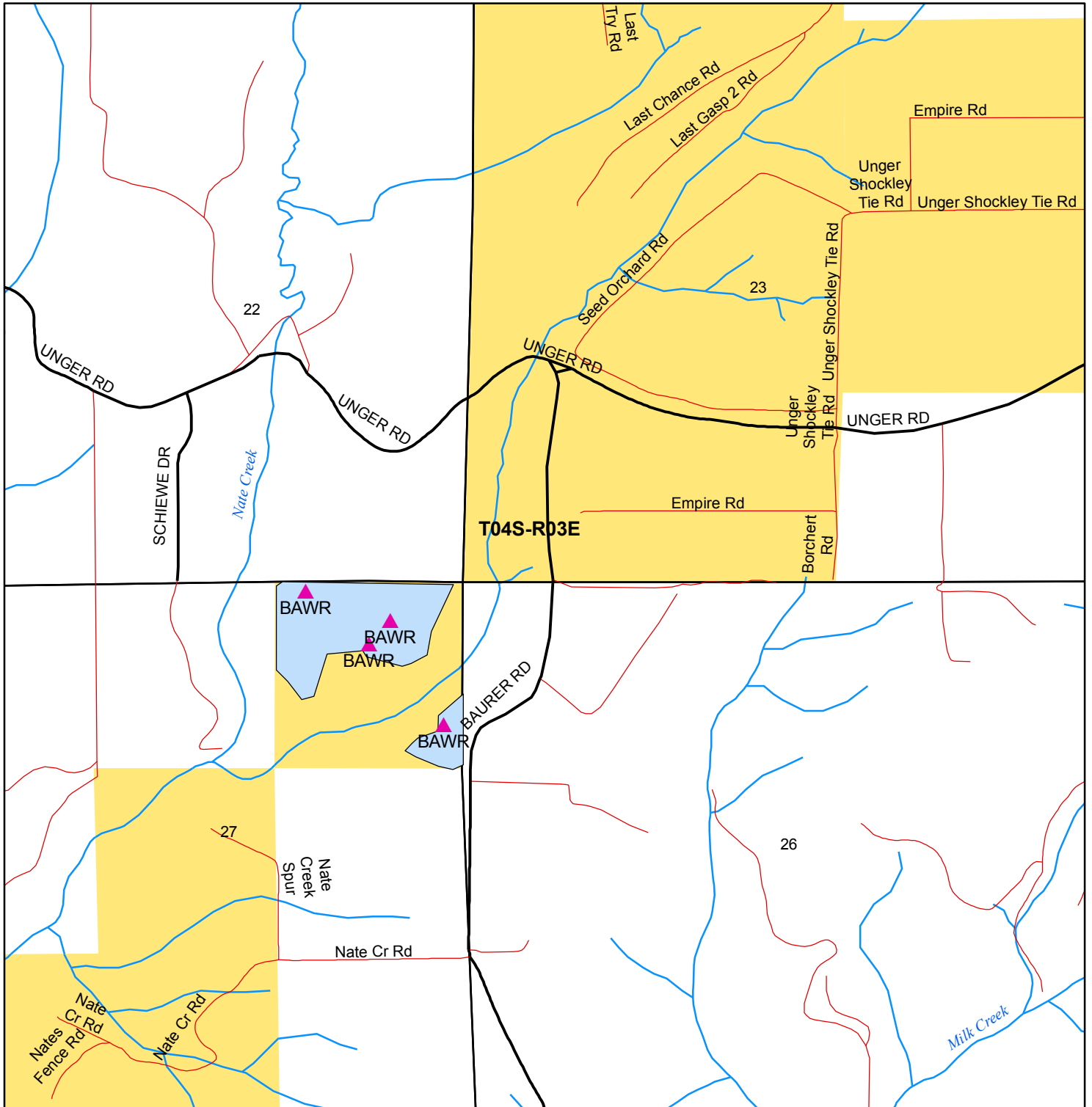


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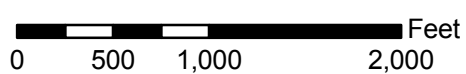


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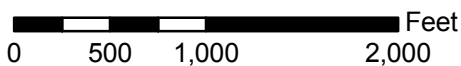
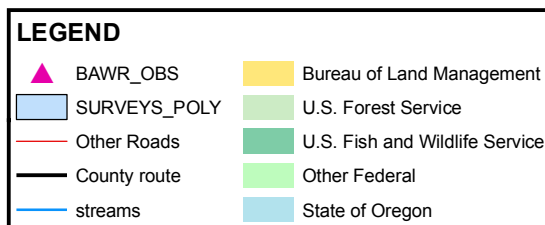
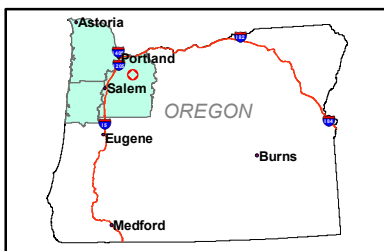
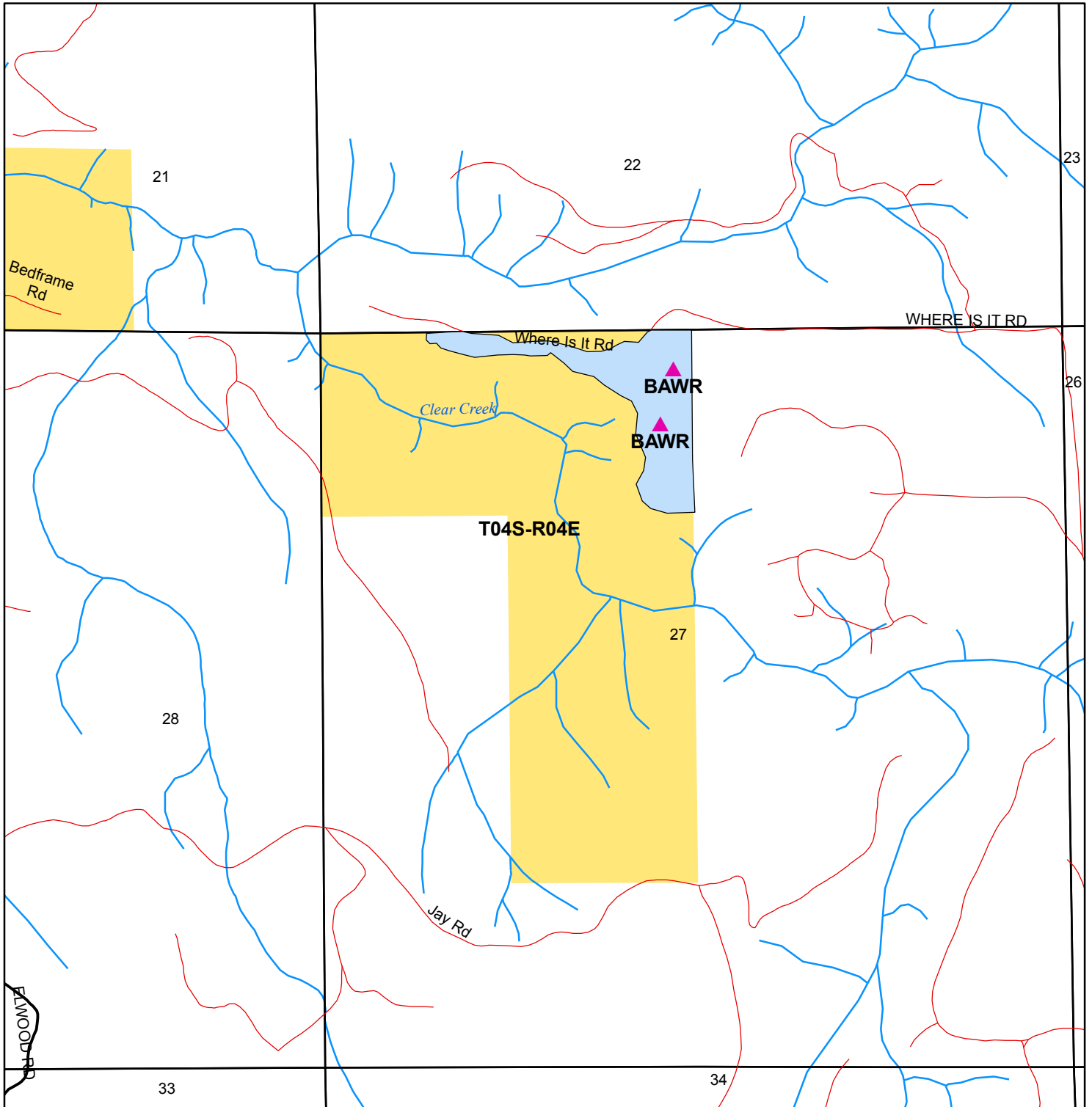


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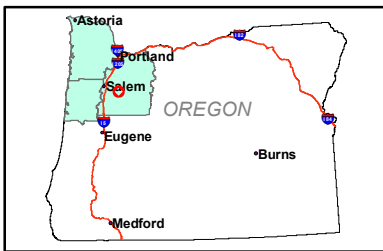
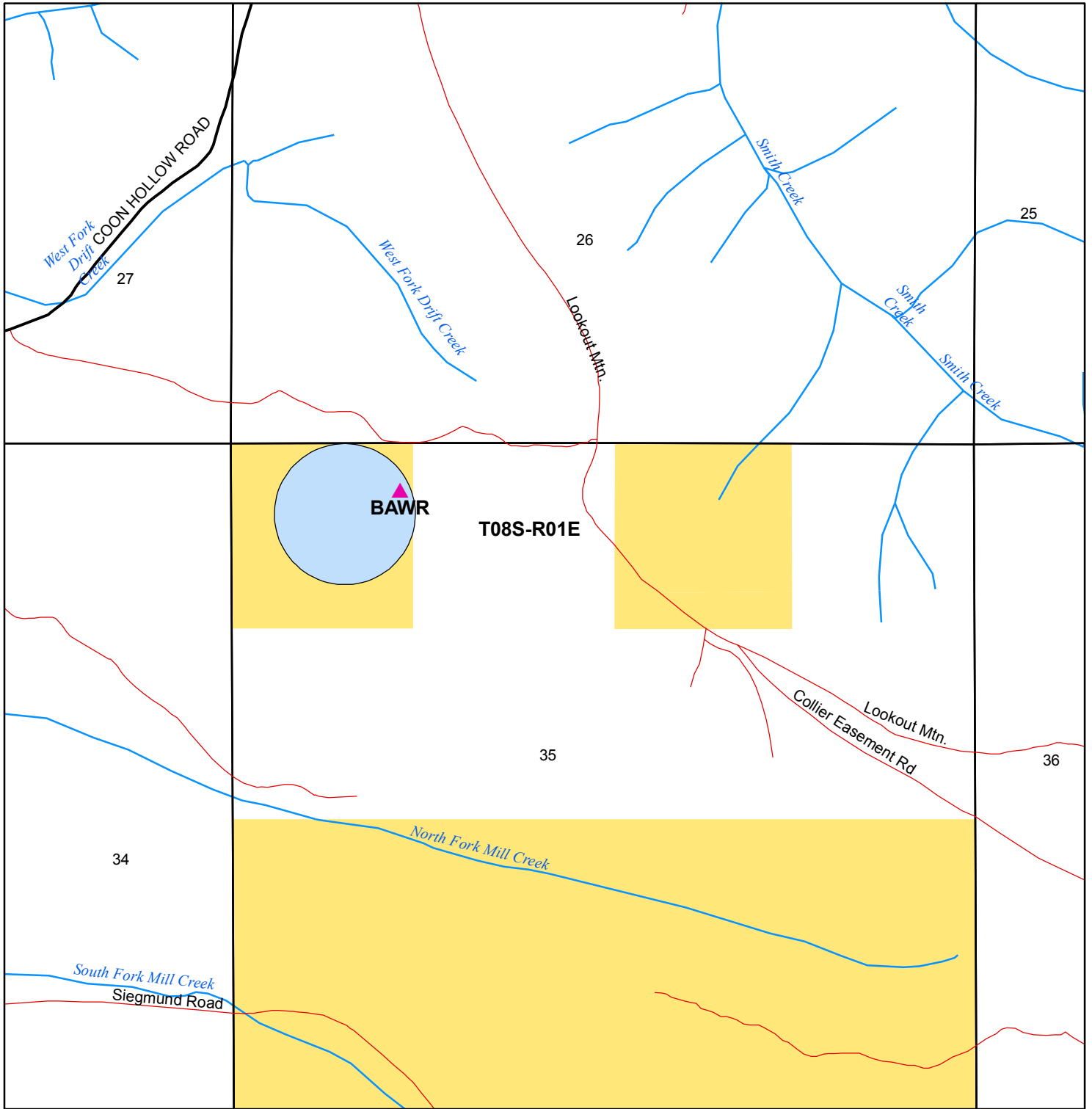
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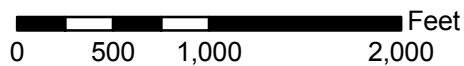


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BAWR SURVEY OBS



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