

Going for the Gold:
A Search for *Texosporium sancti-jacobi*
in Washington



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December 2018

Report submitted to Spokane District Bureau of Land Management (BLM)

Introduction

Texosporium sancti-jacobi is a crustose lichen species belonging to the group of lichens called calicioid lichens, which have an unusual type of fruiting body. Instead of typical apothecia, these lichens have mazaedia, in which the asci disintegrate before the spores are mature, leaving a pile of spores where the fruiting surface was. Most lichens in this artificial group are "pin lichens," where the mazaedium is held up off the crustose thallus by a narrow stalk. In *Texosporium*, the fruiting body is not stalked, but sits right on the crustose thallus.

Texosporium is found in semi-arid shrub-steppe or grassland communities, usually influenced by moisture from a river or lake (Root & McCune 2012). It is reported to occur on flat ground or slightly north-facing slopes that are free from weeds. Soil is fine or coarse-textured, with some decaying organic matter. It appears to be intolerant of disturbance, particularly grazing and fire. It is generally found in communities that are considered late-successional because they have been free of disturbance for more than 20 years (McCune and Rosentreter 1992, Riefner and Rosentreter 2004). In previous searches, we found it often occurred near *Diploschistes muscorum* and *Acarospora schleicheri*, which also tend to be late-successional crust lichen species (pers. comm. Stone, 2013 and 2014).

In Washington, *Texosporium* has been assigned a rank of Threatened (WNHP 2018). It is considered sensitive throughout its range, which also includes California, southwestern Idaho and Oregon. In eastern Oregon, it has been found in a few scattered sites in Umatilla, Wasco, and Jefferson Counties. It is less widely distributed in Washington, where it is found in Benton, Klickitat and Yakima counties. The main goals of this project were to locate additional populations and to find out more about the range and habitat of this species. Bureau of Land Management (BLM) botanists identified a number of BLM owned units in Lincoln, Grant, Yakima and Benton counties as having potential habitat for *Texosporium* for us to survey.

Methods

Three lichenologists spent a total of 6 days each searching the identified BLM units. We prioritized sites that were reported to have no current grazing, although most had experienced grazing in the past even when not located in designated grazing allotments. Within each unit, we looked for areas with well-developed cryptogamic crusts, areas protected by low bedrock, thin-soiled areas with *Artemisia rigida*, and areas with low cover of nonnative grasses. Our target habitats included three of four habitats suggested as those that are known to support uncommon crust species (Root & McCune 2012). We also returned to historic sites at Horse Heaven Hills recorded by Jeanne Ponzetti (2007).

Our goal was to try to locate *Texosporium* thalli in each unit, and in as much of the unit as we could cover with our allotted time. Each thallus may have many minute fruiting bodies, although without fruiting bodies, a thallus is not identifiable. Since the species is too small to discern from a standing position, we spent much time on our hands and knees searching for the fruiting bodies. After locating a patch, we would walk some

distance away (approximately 50 to 100 meters), then locate potentially appropriate habitat to resume crawling and close searching. For these reasons, we are not able to specify how many thalli were present in each area or how many populations were in any unit. Each site we report represents all of the thalli that we found in an area searched, regardless of how far apart the thalli were.

We filled out BLM Survey Forms for all areas we visited. Waypoints were recorded at *Texosporium* sites and information for Element Occurrence (EO) forms was collected. *Texosporium* was not collected at every site; rather, we restricted collections to one per search area (usually a BLM unit). Vouchers will be submitted to the Interagency Special Status/Sensitive Species Program, and finally deposited at WTU (Burke Museum at University of Washington).

Results

Thirteen areas were searched. Several of these were within a single unit as we attempted to cover different parts of large units. In the largest unit, Horse Heaven Hills, we searched four areas. We were unable to relocate *Texosporium* at the 4 previously known sites at Horse Heaven Hills (Table 1). Of the 12 units we attempted to survey, we were unable to access three small units.

Table 1. Sites reported by Jeanne Ponzetti at Horse Heaven Hills (pers. comm. Kim Frymire 2018). All UTM's are in Zone 11 T, and are likely somewhat inaccurate.

UTM E	UTM N
301172	5125062
302383	5125636
302150	5125716
303173	5125756

We found *Texosporium* in five units, several of which had several thalli scattered in a general, large area (Table 2). The number of thalli observed per site ranged from 1 to many. Thalli were only observable when we were searching with our eyes close to the ground, thus it is likely that some areas actually had many more thalli than the number of thalli that were directly observed. Elevation ranged from 955 ft. to 1660 ft., but that was determined by the specific sites we surveyed, and should not be used as elevation limits for future searches.

The Lincoln County *Texosporium* sites were located in shrub-steppe communities dominated by shrub species including *Artemisia tridentata*, *A. rigida*, *Eriogonum niveum* and *E. sphaerocephalum*, and native bunchgrasses including *Poa secunda* and *Pseudoroegneria spicata*. The Walter Lake sites were growing in close proximity to an extensive *Sarcobatus vermiculatus* community. In Benton County, the Horse Heaven Hills *Texosporium* sites were dominated by the same native bunchgrasses but did not have a shrub component. Areas with the most abundant *Texosporium* tended to have a relatively high cover of native plants, although some areas had a significant cover of

invasive annual *Bromus* species and other weed species. This tolerance for invasive grasses in relatively moist habitats was also noted by Root and McCune (2012). The soil crust community was relatively consistent, with *Bryum casepiticium*, *Diploschistes muscorum* and *Cladonia* sp. present at every site, and *Aspicilia reptans*, *Acarospora schleicheri*, *Buellia punctata*, *Leptochidium albociliatum*, *Psora* sp., *Collema tenax* and *Syntrichia ruralis* commonly present. At Horse Heaven Hills, *Trapeliopsis steppica* was usually present.

Most sites where *Texosporium* was found had well-developed soil pinnacles ranging from 1 to 3 cm tall. Some *Texosporium* was observed growing on decomposing bunchgrass clumps. Overall soil depth appeared to vary from very thin to relatively deep (1cm to greater than 25 cm). Soil depth is apparent when looking at the dominant shrub species at the site; *Artemisia tridentata* is usually found on deep soils, whereas *A. rigida* is found on shallow soils.

Aspect varied far more than has been reported in past studies. At Bob's Lake, we mapped a *Texosporium* site that wound around the end of a ridge, with aspects ranging from 135° to 220°. Some Horse Heaven Hills populations were located in south-facing microsites on north-facing slopes. The Marlin Section 17 sites included aspects of 170° and 120°. This is in contrast to previous reports of northerly aspects.

Sites where *Texosporium* has been documented previously are typically very flat (1% to 3%), and this was true of most sites we located. However, a location at the Marlin Sec 17 site had a 10% slope and one Horse Heaven Hills site had a 15% slope. What did appear to be very important was that all sites were near enough to bodies of water to be influenced by the small amount of moisture provided there.

We did not find *Texosporium* in all areas that otherwise appeared to provide suitable habitat. The amount of time necessary for *Texosporium* establishment after disturbances such as wildfire, grazing and trampling is unknown. It likely can be dispersed in two ways: by spores and by fragments. Reestablishment of *Texosporium* populations may be affected by spore dispersal limitations, since the thalli are on the ground within the boundary layer, making for poor spore dispersal. Although thallus fragmentation is a common dispersal mechanism for nearly all lichen species, fragments are relatively heavy and thus typically do not travel far. With widespread fragmentation of biological soil crusts and loss of shrub-steppe habitat due to grazing, wildfires and other causes, some areas that would be suitable habitat for *Texosporium* might not be recolonized because the nearest populations of it might be many kilometers away.

Survey forms for every unit searched and site forms for every find are included. Each search is documented by a route map. Every site is documented on these route maps and by a gpx file. Finally, a file of photographs of most of the sites is included.

Table 2. Locations of *Texosporium* found in this study. All UTM's are Zone 11 T. ID# is the waypoint name except for some vouchers, where the waypoint and the voucher name is listed.

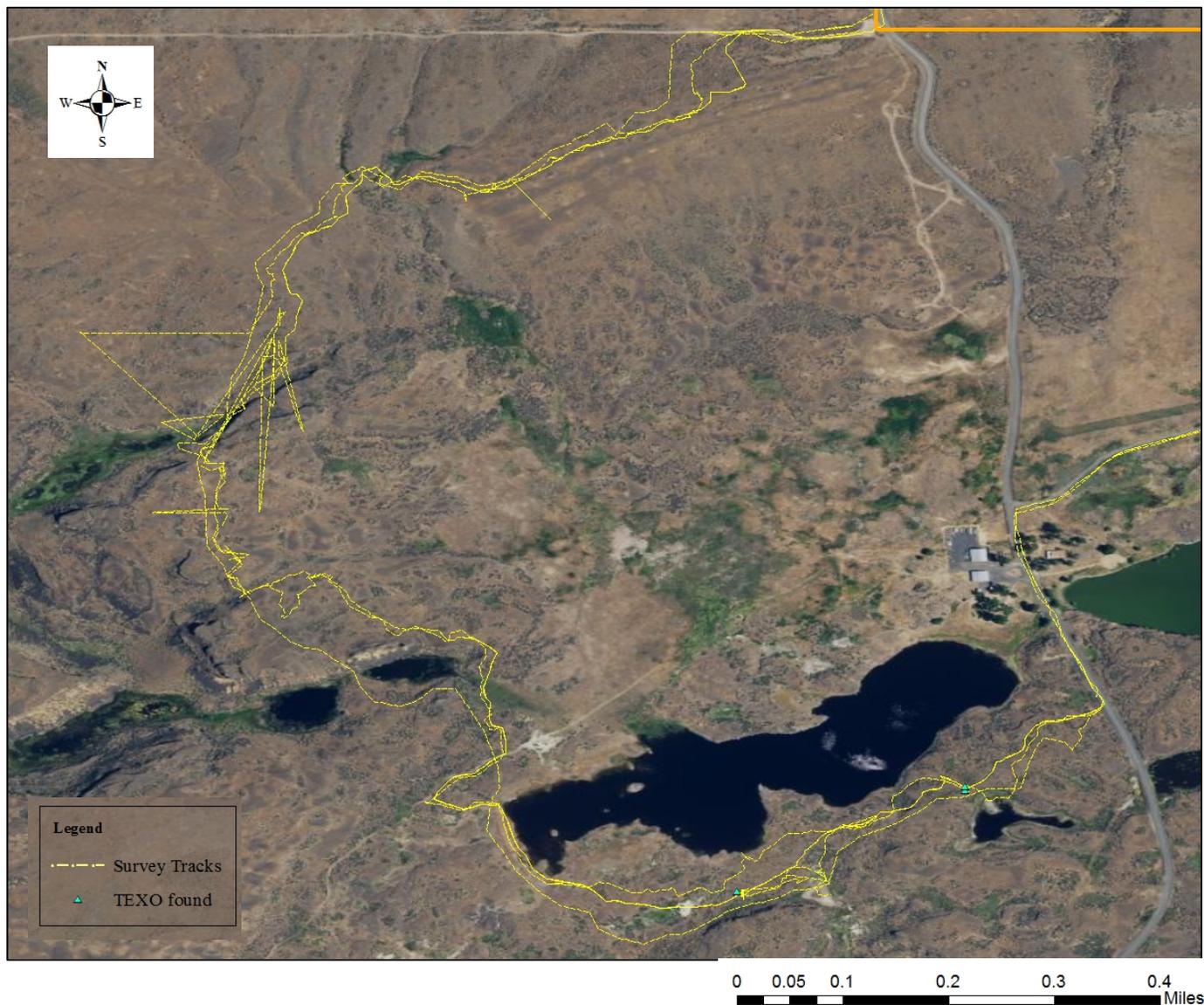
Date	Voucher	Site name	ID #	County	Aspect	Slope	Elev (ft)	UTM, 11 T
9/1	Y	Walter Lake	DS 9995	Lincoln	180	1%	1566	0368439 5252142
9/1		Walter Lake	AH 001	Lincoln	N	2%	1614	0368672 5252300
9/2	Y	Bob's Lake	AH002	Lincoln	SE	5%	1555	0367312 5249913
9/2		Bob's Lake	LV Texo 1	Lincoln			1535	0367277 5249877
9/2		Bob's Lake	LV Texo 2	Lincoln			1507	0367128 5249854
9/2		Bob's Lake	AH 003	Lincoln	SW		1527	0367240 5249979
9/2		Bob's Lake	AH 004	Lincoln	SW		1534	0367249 5249984
9/2		Bob's Lake	005=DS212	Lincoln		2%	1509	0367126 5249758
9/2		Bob's Lake	AH 006	Lincoln			1500	0367156 5249643
9/2		Bob's Lake	AH 007	Lincoln			1703	0367739 5249615
9/2		Bob's Lake	DS 210	Lincoln	220	3%	1526	0367288 5249905
9/2		Bob's Lake	DS 211	Lincoln	220	3%	1529	0367283 5249911
9/2		Bob's Lake	DS waypt213	Lincoln			1690	0367653 5249627
9/2		Bob's Lake	KB 855	Lincoln			1524	0367274 5249881
9/2		Bob's Lake	KB 856	Lincoln			1532	0367277 5249876
9/3	Y	Marlin 7, Erickson Rd.	AH 010		225	1%		
9/3		Marlin 7, Erickson Rd.	KB 877/ Eric Texo 1	Lincoln	150	1%	1590	0351510 5253472
		Marlin 7, Erickson Rd.	AH 011		180	0%	1515	0351267 5253361
		Marlin 7, Erickson Rd.	AH 012		SW	1%	1596	0351093 5253276

Date	Voucher	Site name	ID #	County	Aspect	Slope	Elev (ft)	UTM, 11 T
9/3	Y	Marlin 17	DS 9998 waypt 214	Lincoln	70	1%	1377	0353550 5250947
9/3		Marlin 17	KB 870	Lincoln	280	2 to 3 %	1401	0353750 5250944
9/3		Marlin 17	KB 871	Lincoln	230	8 - 10 %	1425	0353795 5250978
9/3		Marlin 17	KB 872	Lincoln	160	3%	1433	0353888 5251106
9/3		Marlin 17	KB 873	Lincoln	140	3 to 4 %	1452	0353858 5251147
9/3		Marlin 17	DS 215	Lincoln	80	2%	1435	0353646 5251119
9/3		Marlin 17	DS 216	Lincoln	60	3%	1448	00353580 5251135
9/3		Marlin 17	DS 217	Lincoln			1474	00353392 5251209
		Marlin 17	AH 008	Lincoln	315	gentle	1390	00353619 5250819
		Marlin 17	AH 009	Lincoln	SW		1456	00353898 5250708
9/5		Horse Heaven Hills	884, 885/ hhh texo 1	Benton	170	2 to 3 %	1590	0303044 5125432
9/6	Y	Horse Heaven Hills	Site 2 Chandler Ridge	Benton	120	2 to 4%	955	0307693 5124031
9/6		Horse Heaven Hills	DS 226	Benton	340	2%	1659	0304616 5125350
9/6		Horse Heaven Hills	AH 013	Benton	270	15%	1460	0302052 5125245

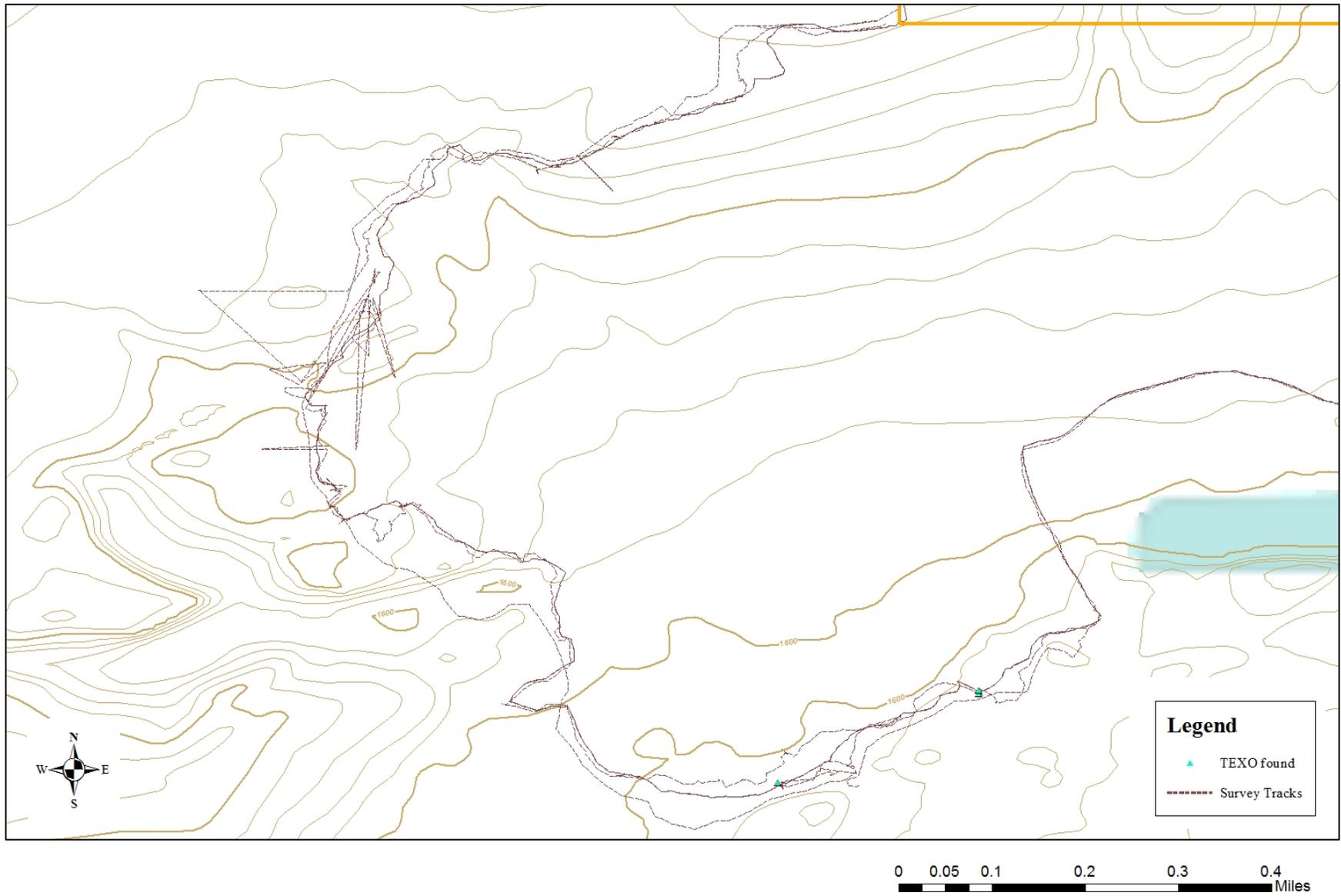
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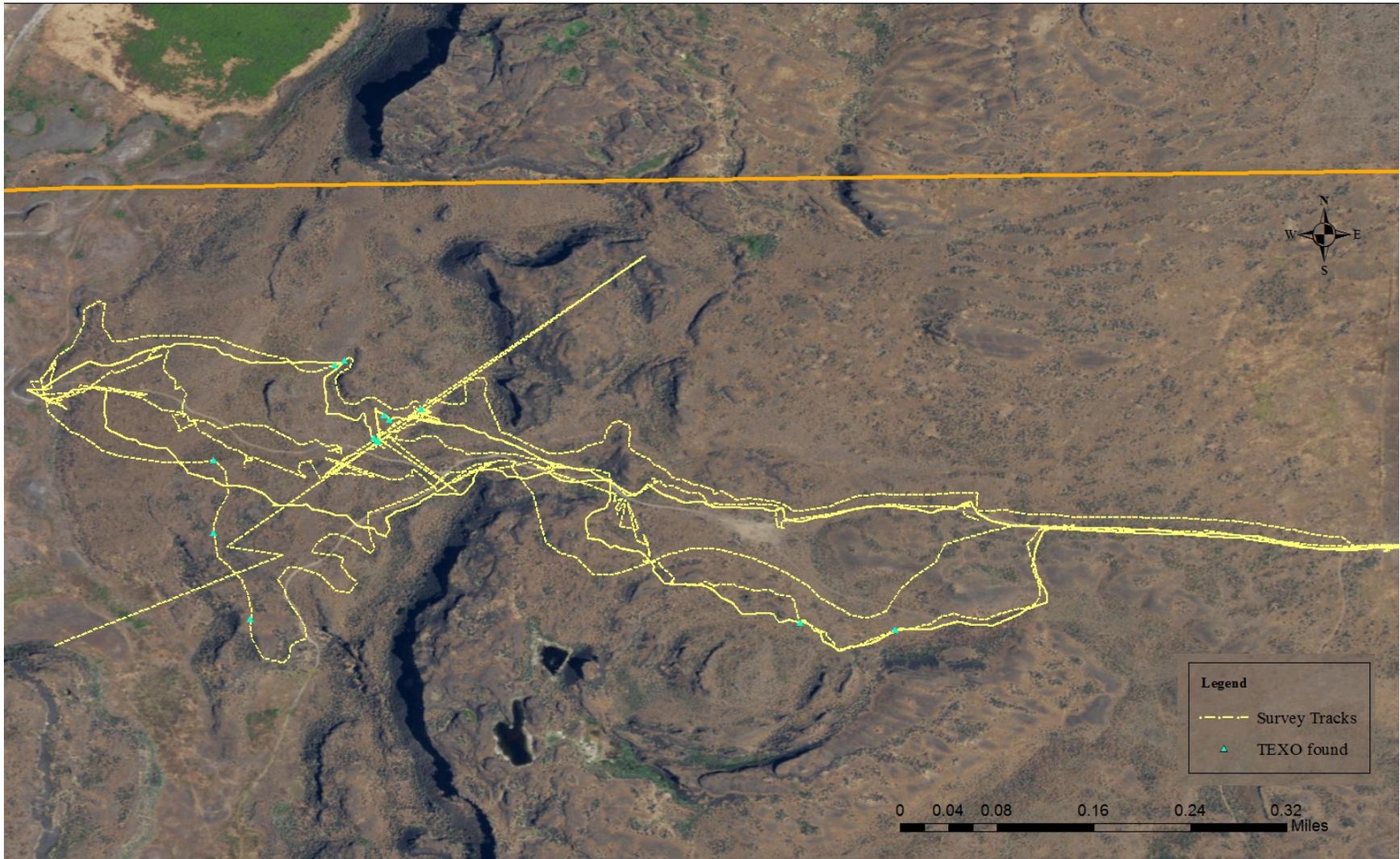
Texosporium sancti-jacobi surveys Walter Lake Area 2018
T22N R32E Sec11



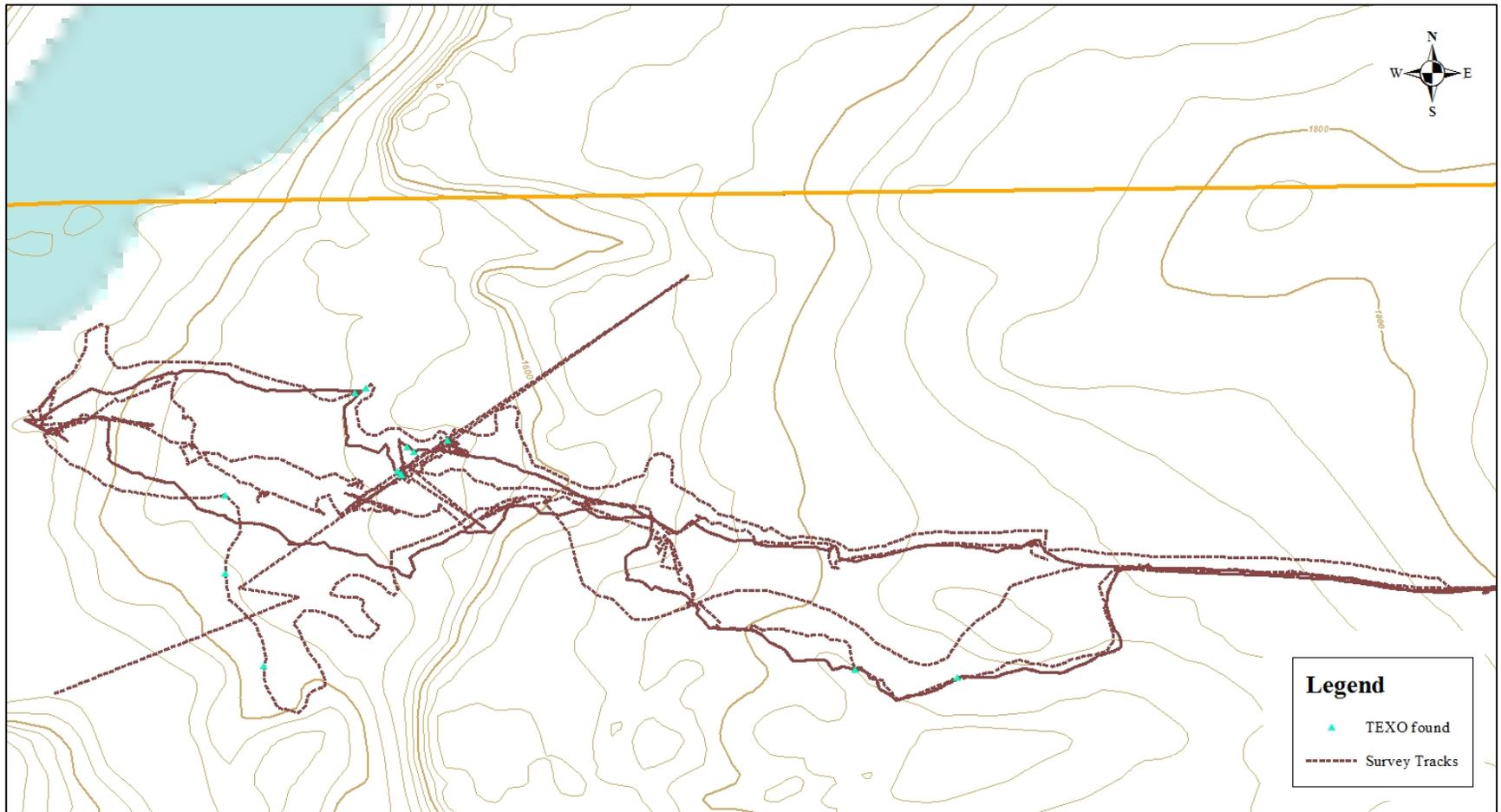
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T22N R32E Sec11



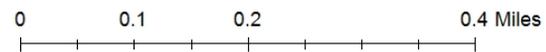
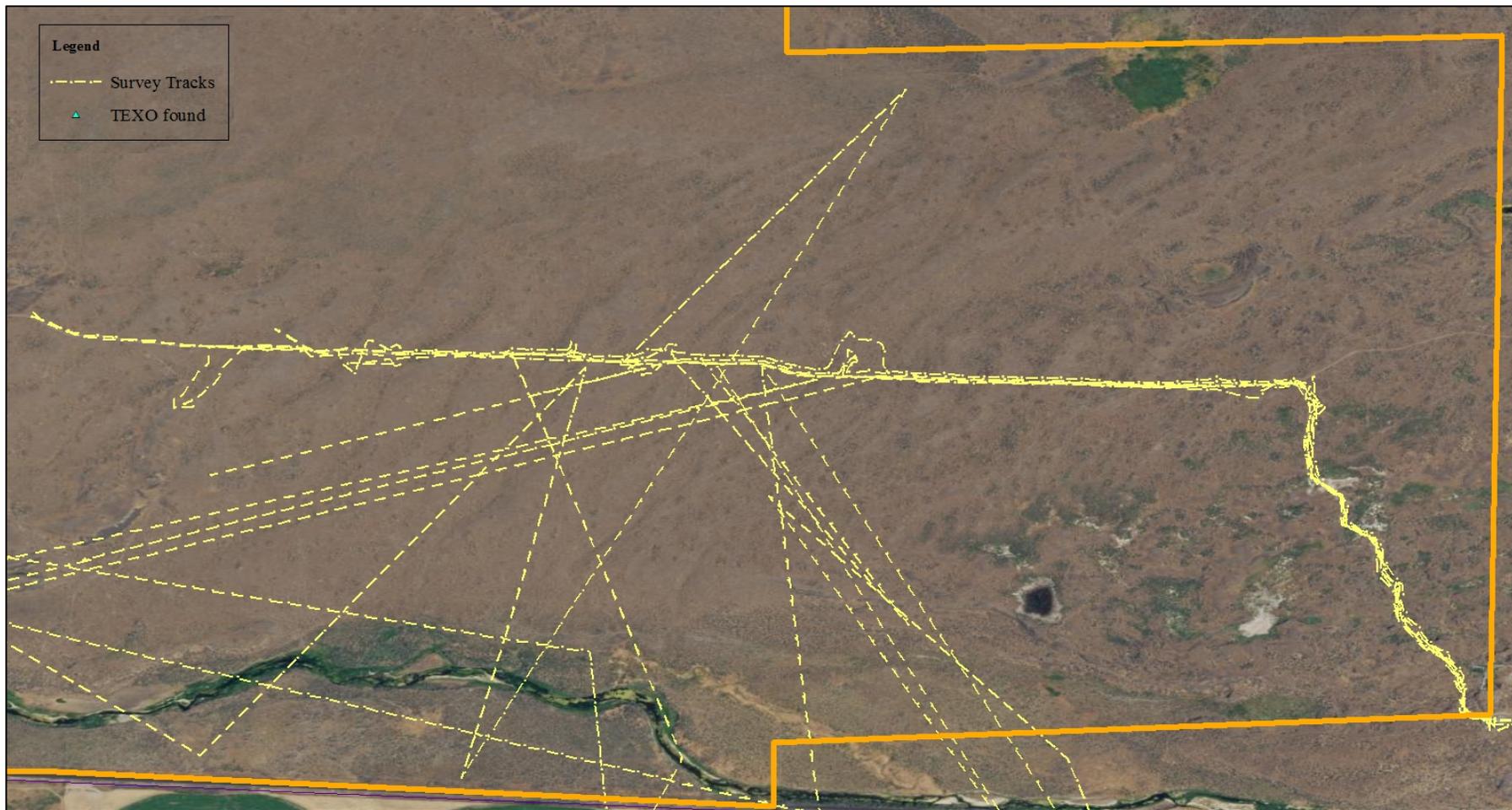
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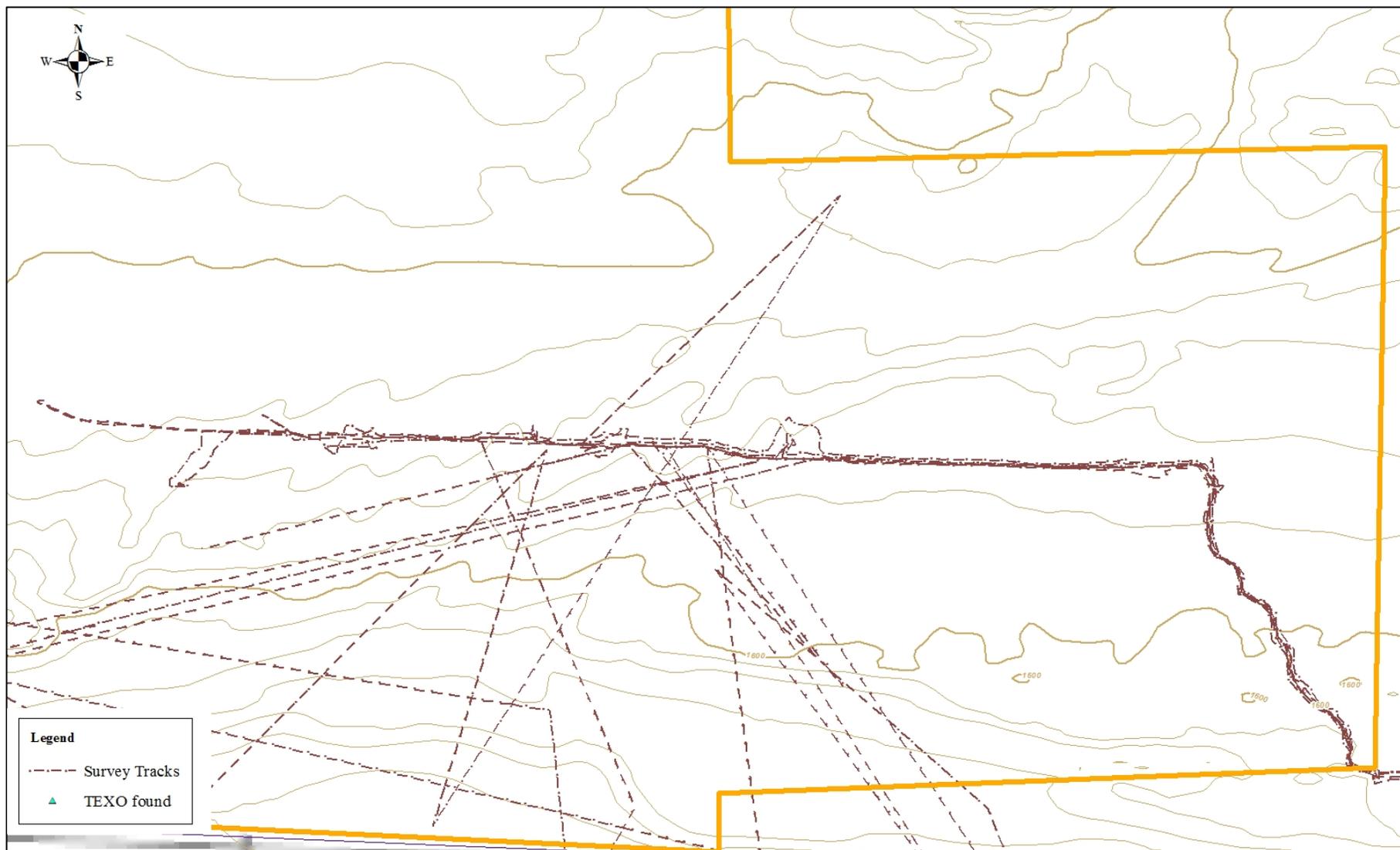
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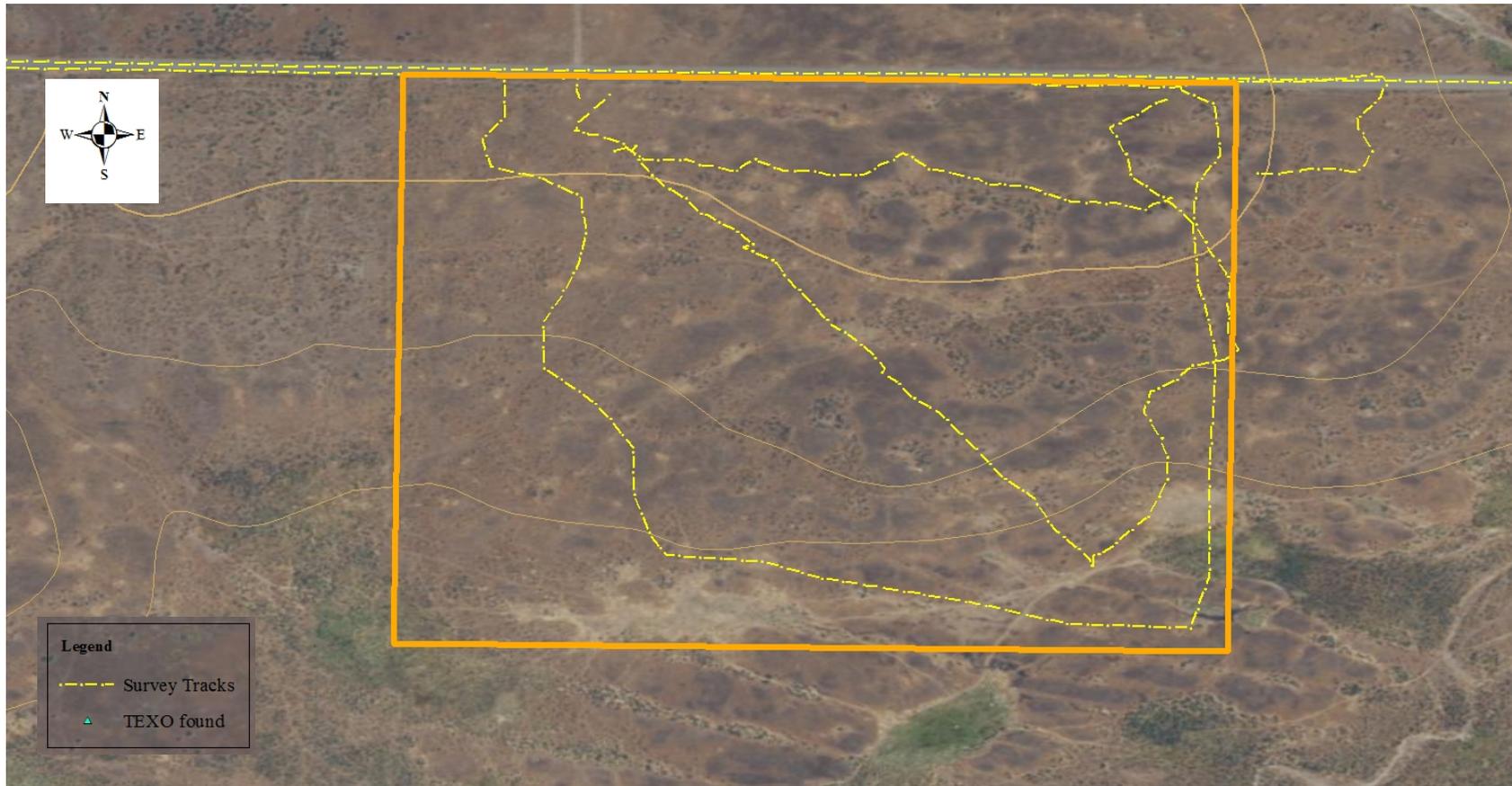
Texosporium sancti-jacobi surveys Lakeview Trail 2018
T21N R33E Sec6



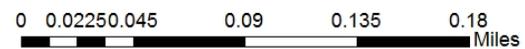
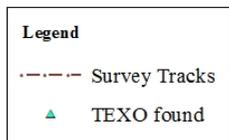
Texosporium sancti-jacobi surveys Lakeview Trail 2018
T21N R33E Sec6



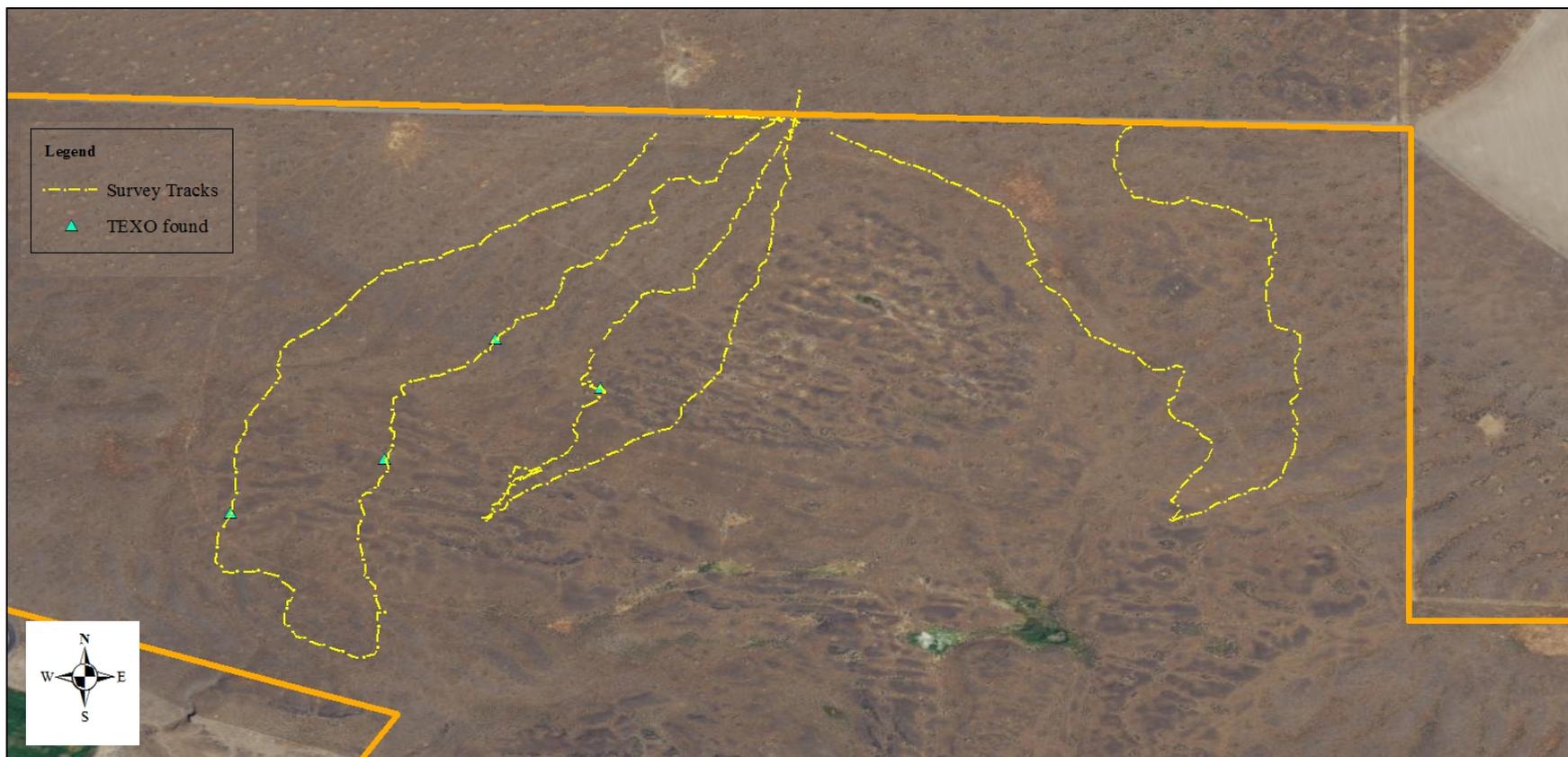
Texosporium sancti-jacobi surveys West of Reiser Falls 2018
T23N R31E Sec14



Texosporium sancti-jacobi surveys West of Reiser Falls 2018
T23N R31E Sec14

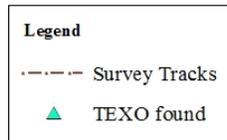
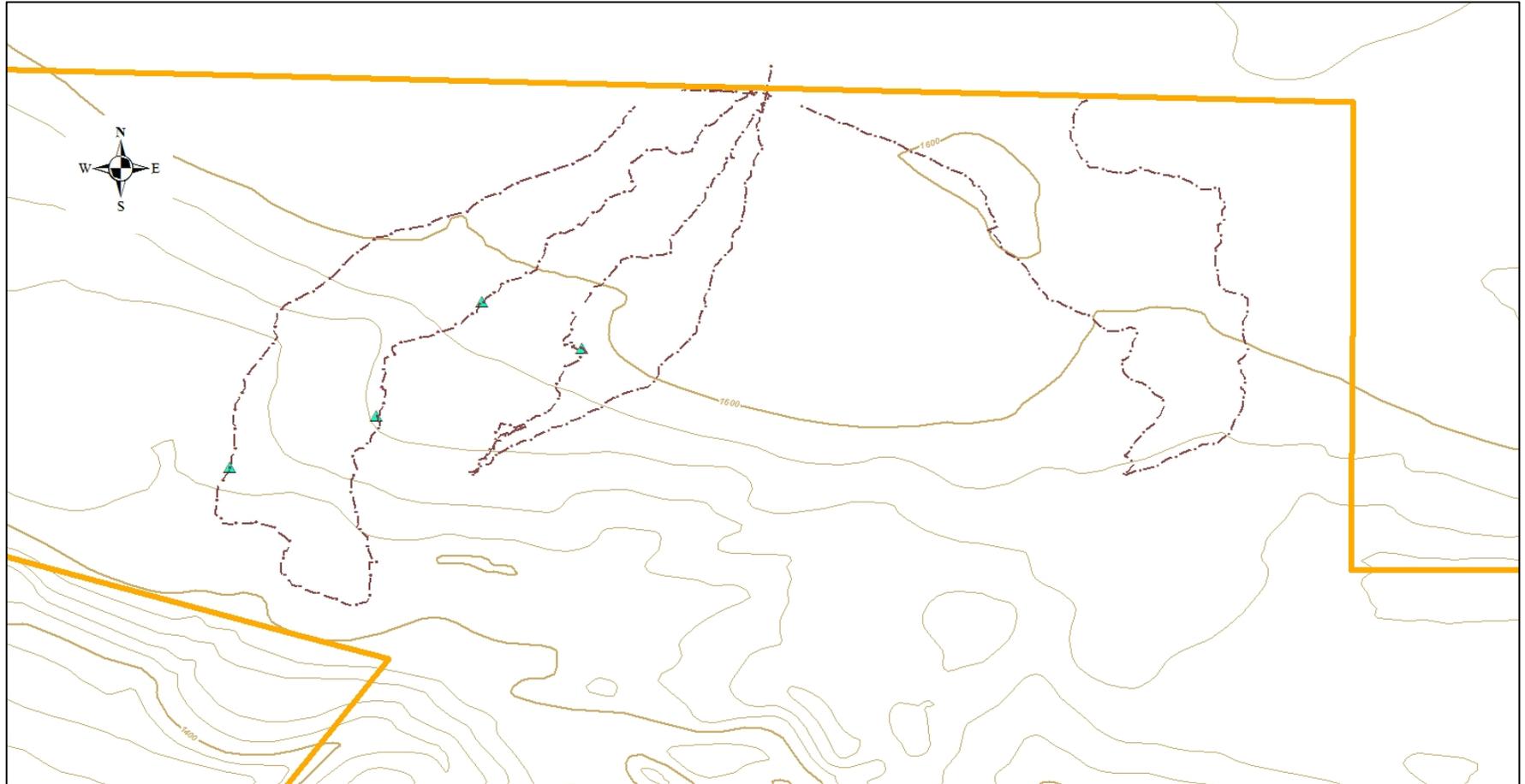


Texosporium sancti-jacobi surveys Marlin – Erickson Rd. 2018
T 22N R 31E Sec 7

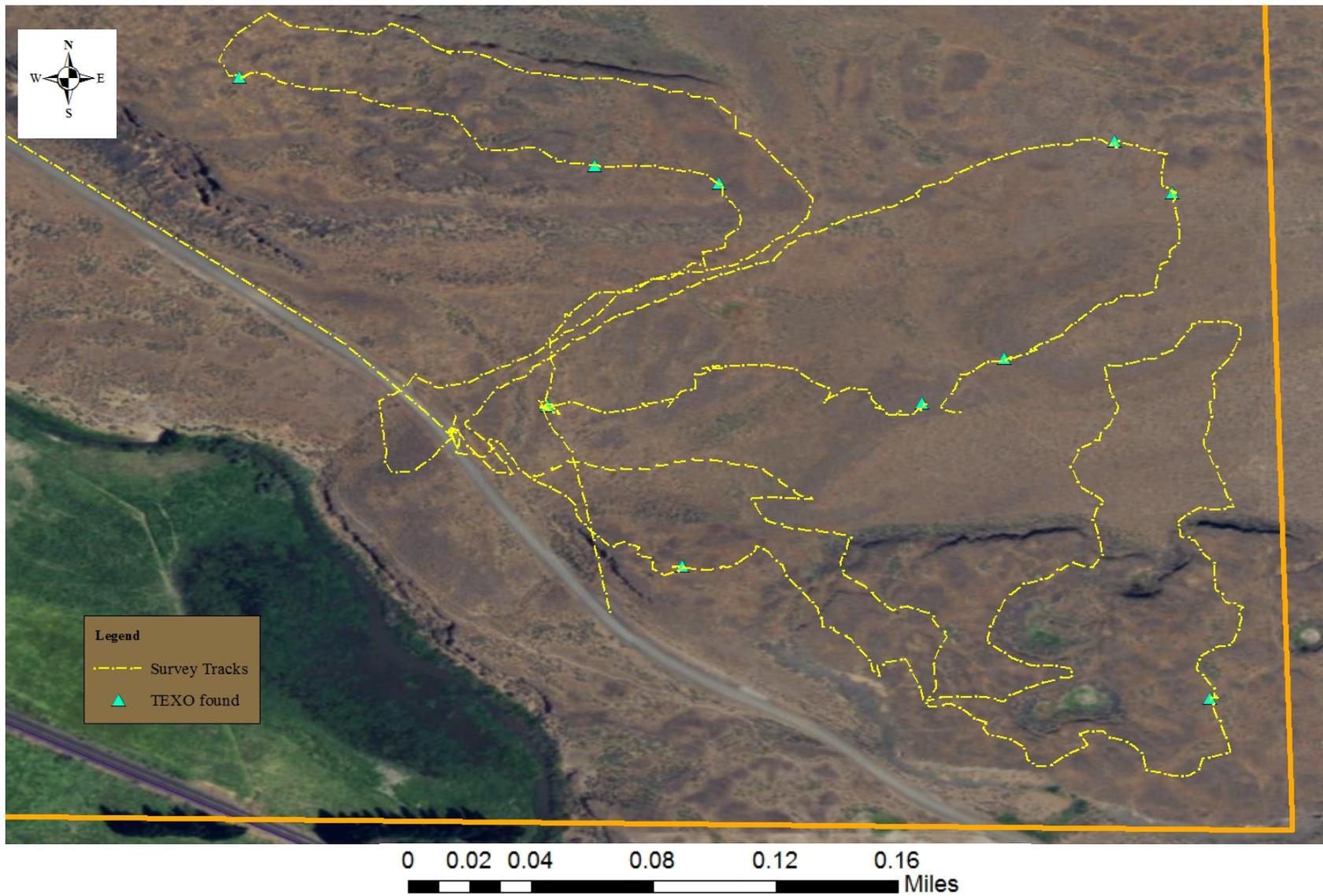


0 0.05 0.1 0.2 0.3 0.4 Miles

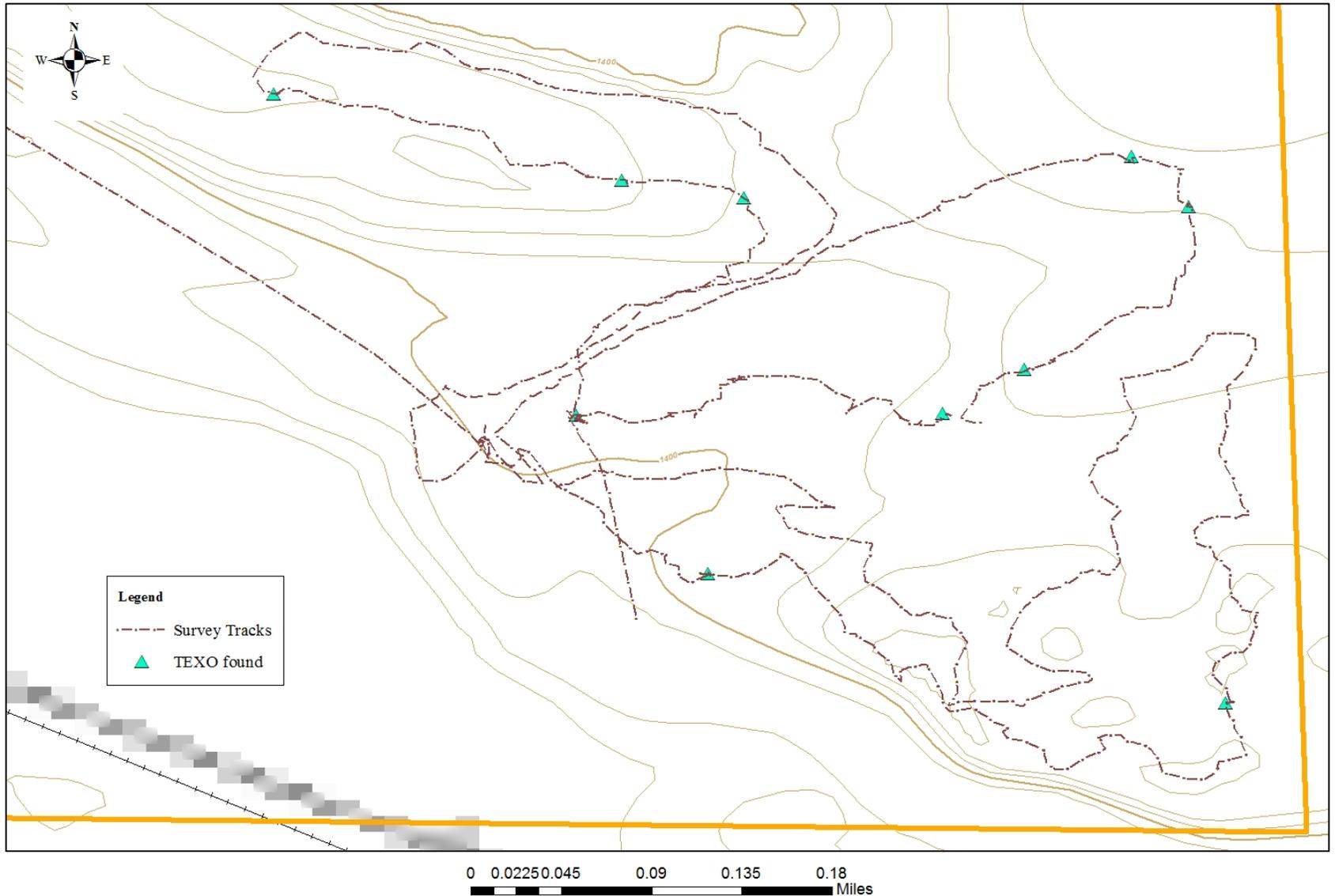
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T 22N R 31E Sec 7



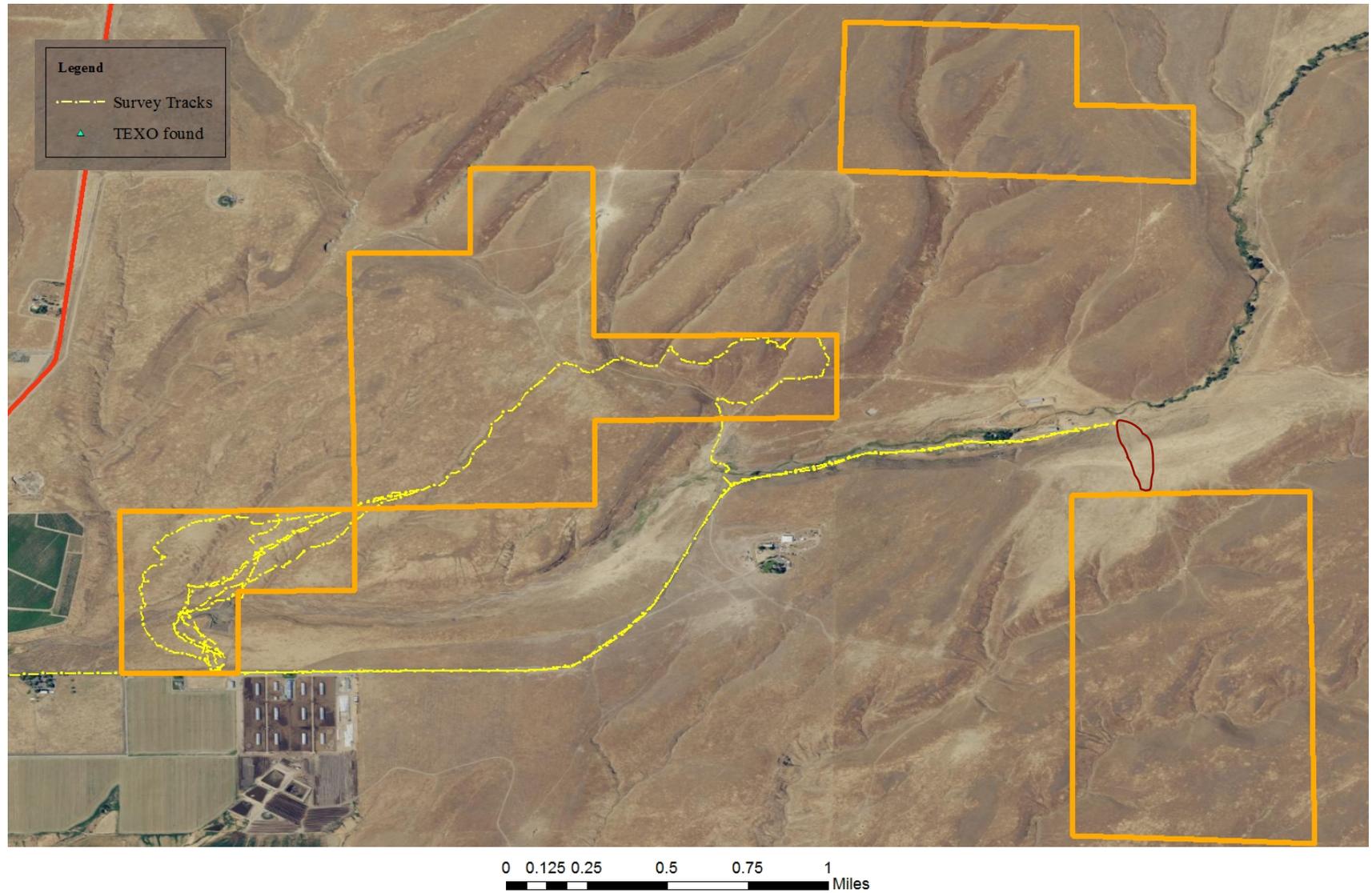
Texosporium sancti-jacobi surveys Marlin – along RR 2018
T 22N R 31E Sec 17



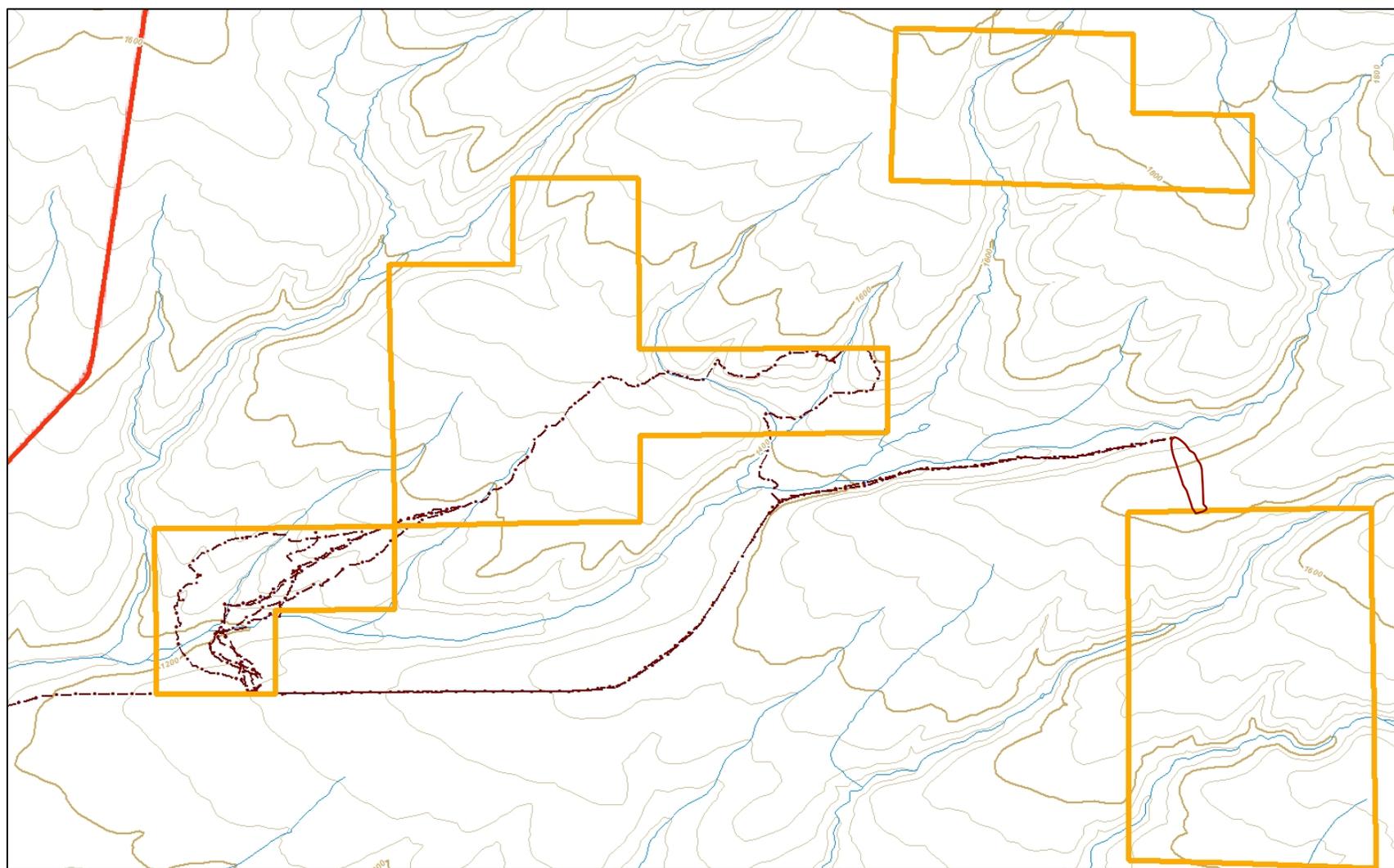
Texosporium sancti-jacobi surveys Marlin – along RR 2018
T 22N R 31E Sec 17



Texosporium sancti-jacobi surveys Lewandowski 2018
T 10N R 23E Sec 2 & 4 and T 11N R 23E Sec 34



Texosporium sancti-jacobi surveys Lewandowski 2018
T 10N R 23E Sec 2 & 4 and T 11N R 23E Sec 34

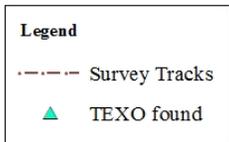
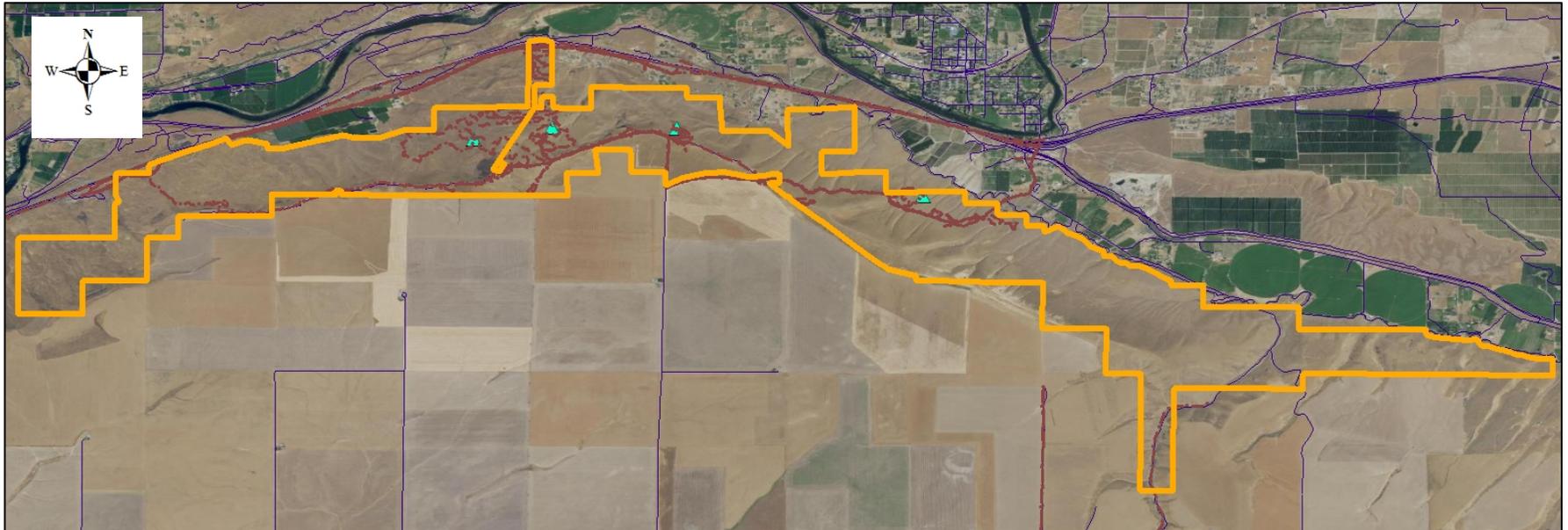


0 0.125 0.25 0.5 0.75 1 Miles

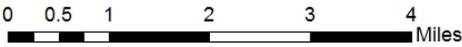
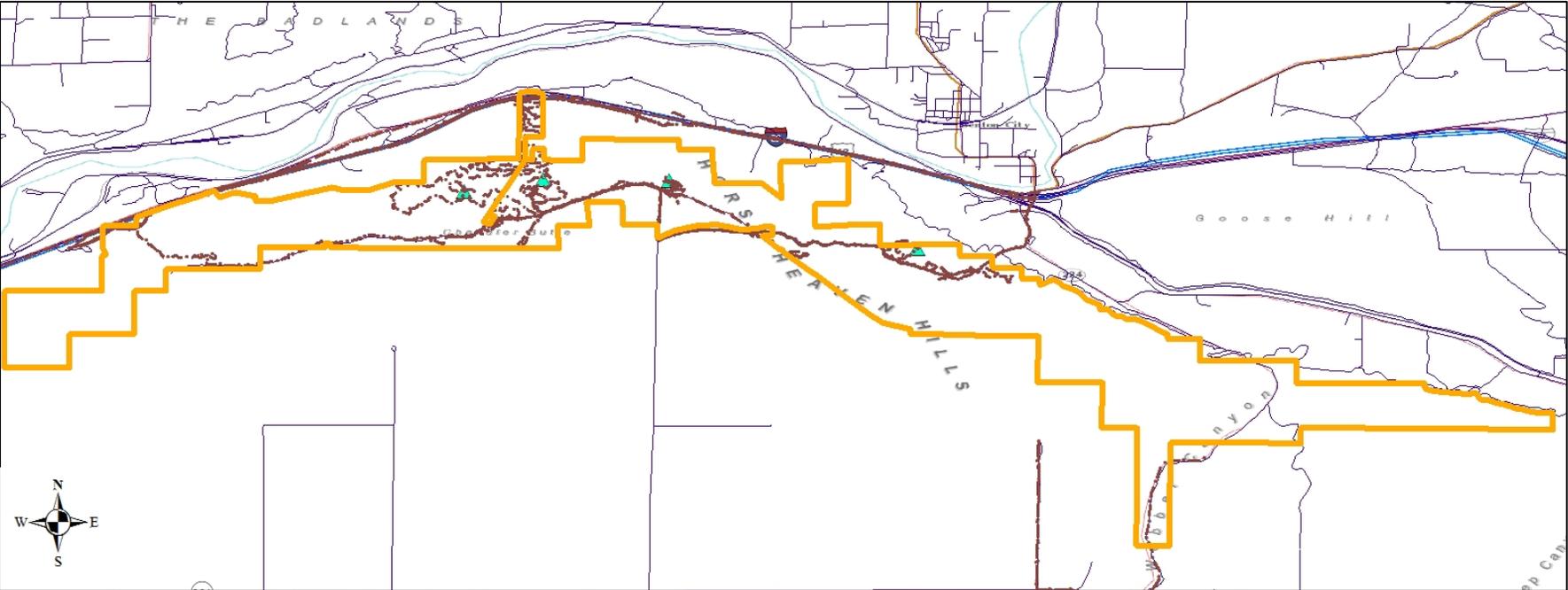
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- Survey Tracks
- ▲ TEXO found

Texosporium sancti-jacobi surveys Horse Heaven Hills 2018



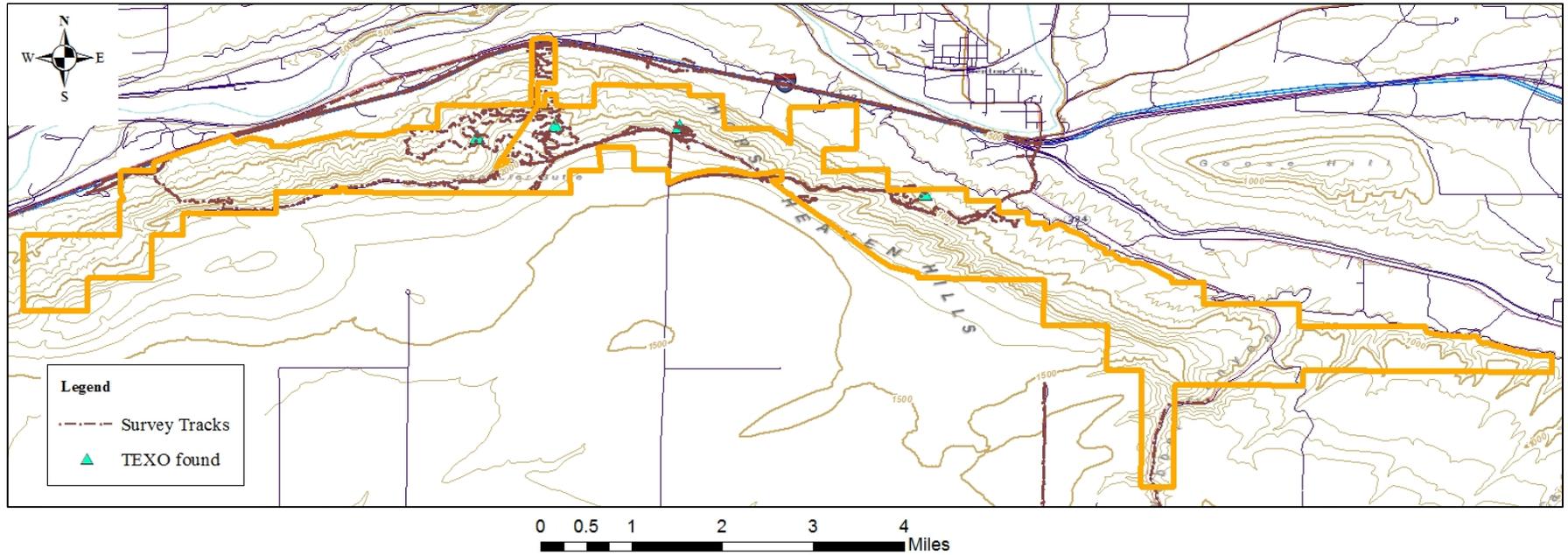
Texosporium sancti-jacobi Horse Heaven Hills 2018



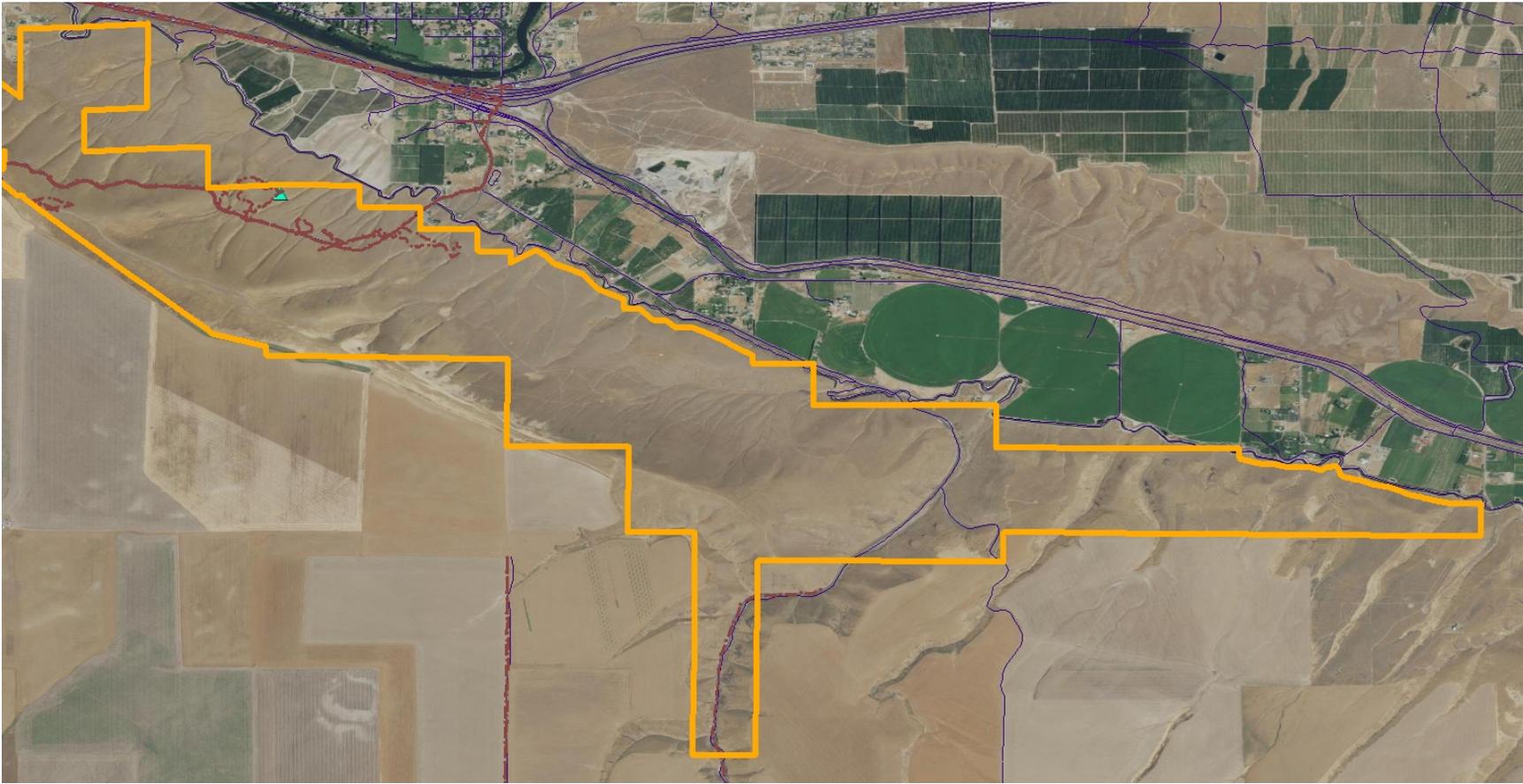
Legend

- Survey Tracks
- ▲ TEXO found

Texosporium sancti-jacobi surveys Horse Heaven Hills 2018



Texosporium sancti-jacobi surveys Horse Heaven Hills East 2018
T9N R26E Sec24, T9N R27E Secs30&31

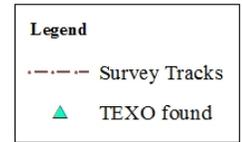
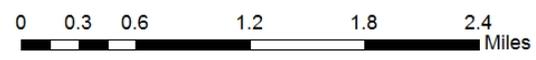
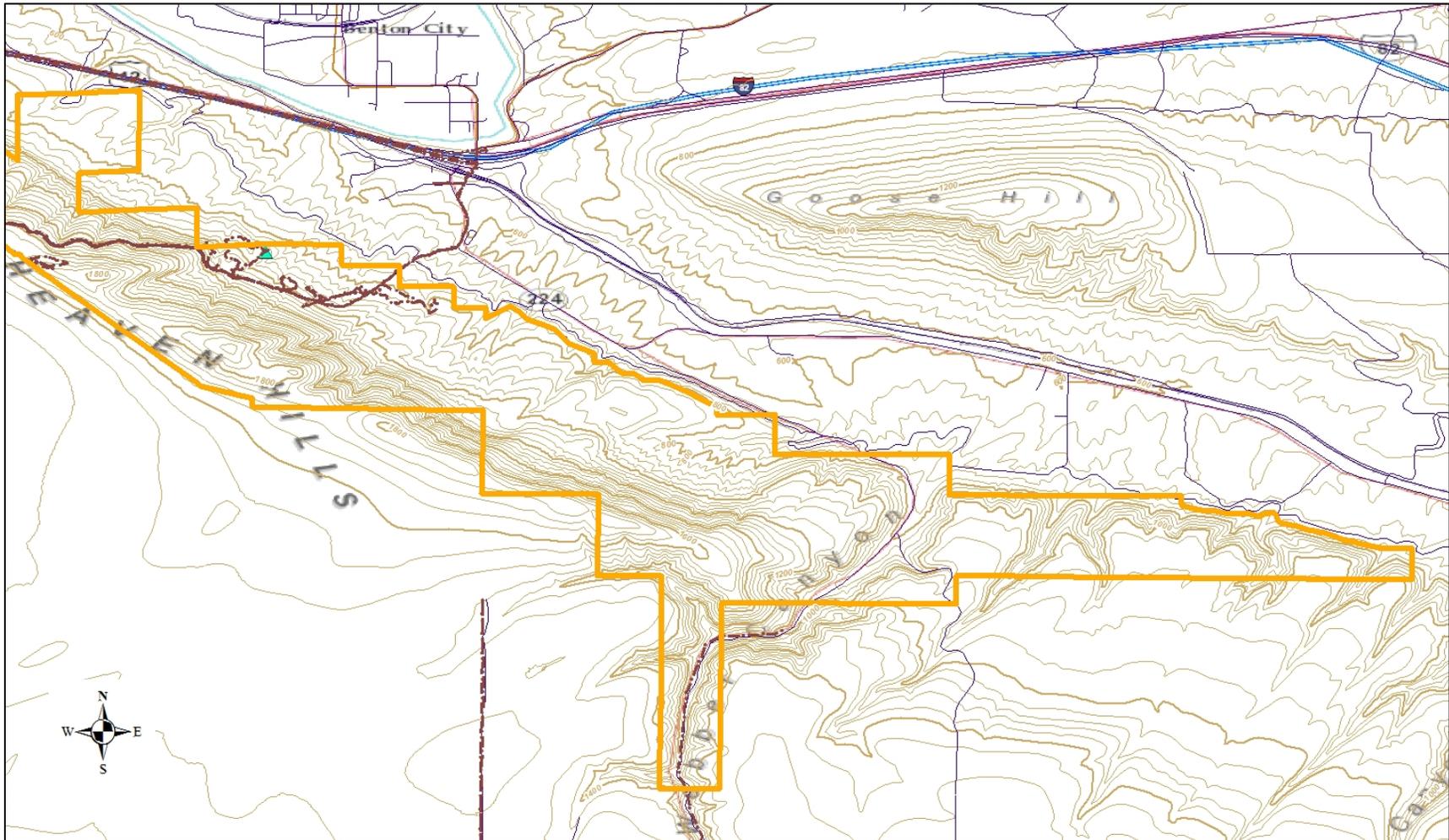


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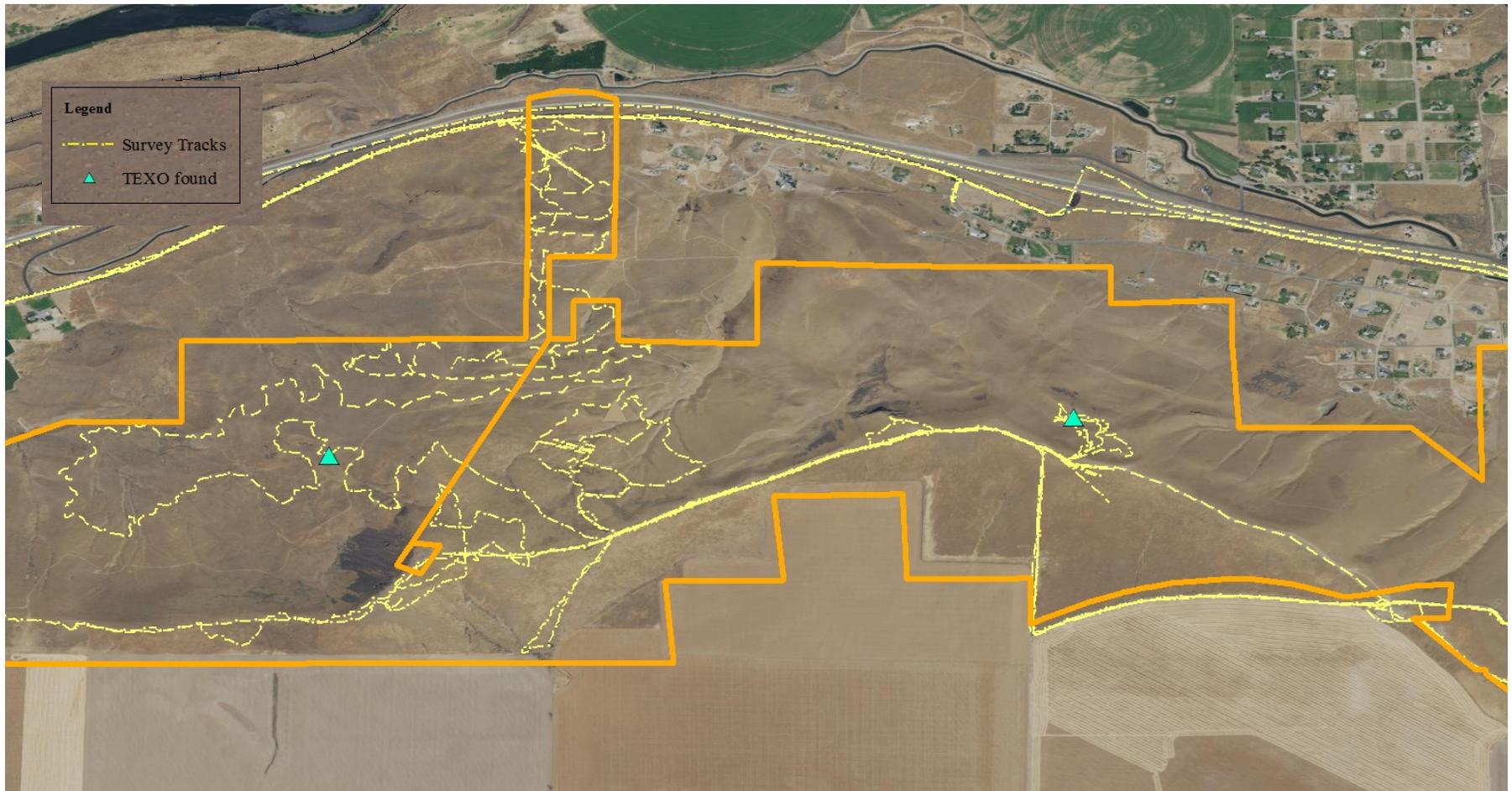
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Texosporium sancti-jacobi surveys Horse Heaven Hills East 2018
T9N R26E Sec24, T9N R27E Secs30&31

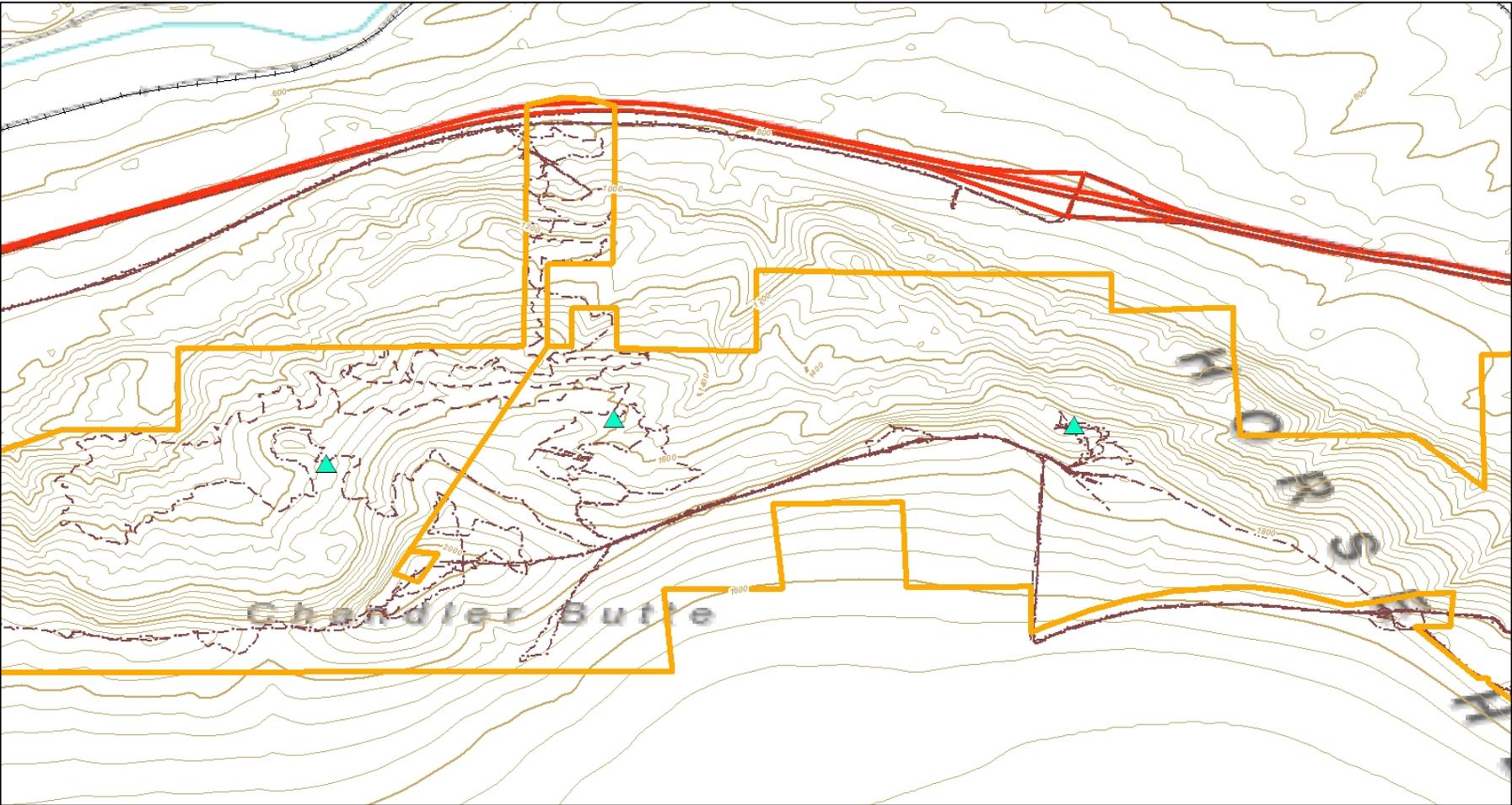


Texosporium sancti-jacobi surveys Horse Heaven Hills 2018
Around Chandler Butte T9N R26E Secs15,21,22&23



0 0.125 0.25 0.5 0.75 1 Miles

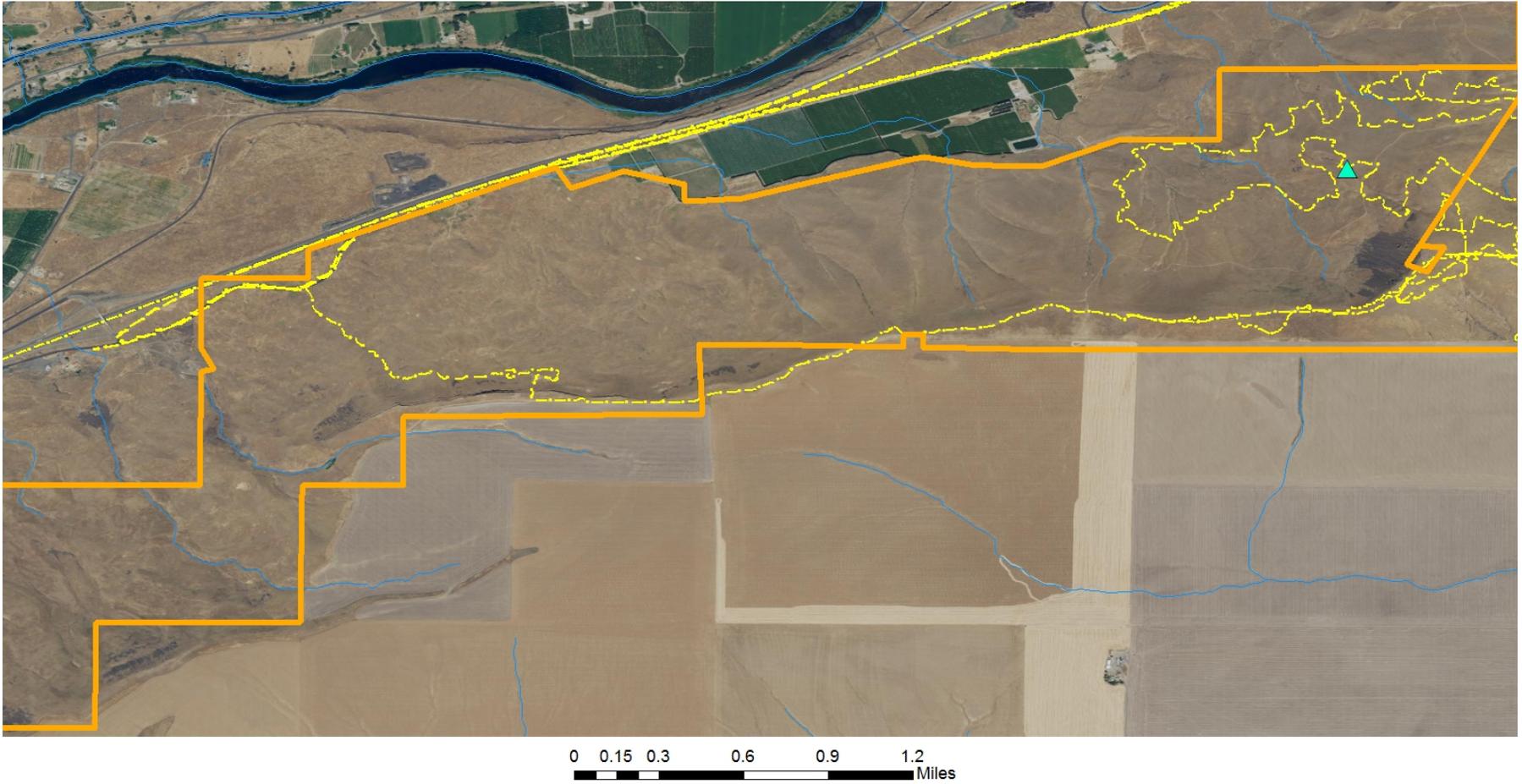
Texosporium sancti-jacobi surveys Horse Heaven Hills 2018
Around Chandler Butte T9N R26E Secs15,21,22&23



0 0.125 0.25 0.5 0.75 1 Miles

- Legend**
- Survey Tracks
 - ▲ TEXO found

Texosporium sancti-jacobi surveys Horse Heaven Hills West 2018
T9N R26E Secs19, 20 &30



Texosporium sancti-jacobi surveys Horse Heaven Hills West 2018
T9N R26E Secs19, 20 &30

