Preliminary assessment of the extent of the leaf fossil beds at Wheeler High School, Fossil, Wheeler County, Oregon

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EXECUTIVE SUMMARY

At the request of the Oregon Paleo Lands Institute Board, geologists from the Oregon Department of Geology and Mineral Industries (DOGAMI) undertook a preliminary investigation of the extent of the fossil beds at Wheeler High School in the town of Fossil, Wheeler County, Oregon. The investigation included several days of fieldwork, a magnetometer survey, chemical analysis of lava flows, and water well drilling log analysis. Our findings include:

- The fossil beds exposed north of the football field slope southwest at 20° to 30°, which means that they are at depths of almost 60 m (200 ft) below the surface beneath the existing high school building.
- The beds are probably cut off by a fault that runs east to west beneath the football field and have probably been displaced to even greater depths on the south side of the fault.
- There is probably little additional fossil resource available on school property adjacent to the currently exposed deposits.
- Thick soil and colluvium appear to cover bedrock on most slopes in the area; shallow excavations may be required for new fossil discoveries.
- The fossil beds at the high school likely extend east and west onto private property but would require excavation to reveal.
- Fossil beds occur adjacent to the Wheeler County Waste Transfer Facility.
- Water well data and some field evidence suggest that fossil beds may be present south and east of the County Fairgrounds in Fossil.

Our conclusion is that it is unlikely to be possible to develop additional fossil resources on the high school property beyond the existing beds. These findings are preliminary; extensive additional fieldwork and drilling are needed. A more cost effective strategy may be to prospect for additional fossil beds on nearby public property at the fairgrounds or at the waste transfer facility. A detailed map of the distribution of fossil-bearing layers in the existing deposit, along with a program to manage excavation spoils, would give an improved understanding of the volume and geometry of the fossil deposits and help conserve the resource to extend the life of the public fossil collecting program.

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INTRODUCTION

Staff from the Oregon Department of Geology and Mineral Industries (DOGAMI) conducted short field visits to the Wheeler High School leaf fossil locality in Fossil, Oregon, in November 2004 and January 2005. The visits were at the request of Richard Ross, the Director of the Oregon Paleo Project, in response to questions raised by potential funding organizations. The curator for the Wheeler High School locality, Karen Masshoff, accompanied DOGAMI staff in the field. The purpose of the visit was threefold: 1) to determine, if possible, whether a sufficiently large fossil resource remains on school property to support further development; 2) to provide guidance for the Oregon Paleo Lands Institute Board regarding the steps needed to fully determine the size, physical location, geologic character, and significance of the fossil resource; and 3) to identify other areas in and around the town of Fossil where similar paleontological resources may occur.

Present site development plans assume that the same fossil leaf beds excavated on the ridge north of the high school football field are present beneath the football field. The initial DOGAMI visit noted indirect geologic evidence for a fault that probably truncates the southward extension of the fossil beds beneath the football field. A ground magnetometer survey to determine if there is geophysical evidence for the suspected fault, coupled with cursory examination of water well logs in the area, indicates a strong probability that a large fault is present. The overall geologic structure of the area, together with a few field observations, suggests that the fossiliferous layers may be present on the hill to the southeast of the fairgrounds. Additional exposures of fossiliferous layers were observed at the Wheeler County Waste Transfer Facility.

BACKGROUND

One of Oregon's most accessible fossil collecting sites is located on the Wheeler High School grounds. School groups and hobbyists have collected a large variety of plant fossils from this central Oregon site since its discovery in 1949. The locality contains plant macrofossils (including leaves, stems, and fruits) that make up the well-known Bridge Creek flora (Chaney, 1925). Most Bridge Creek flora sites are located in the John Day Fossil Beds National Monument and as such are not open to public collecting. The Wheeler High School site is one of the few fossil collecting sites in central Oregon that is currently open to the general public. If sufficient fossil-rich material remains after more than 50 years of use, then the high school site would

(Leaf beds, continued from page 34)

be an ideal place to develop educational, collecting, and curatorial facilities.

SITE GEOLOGY

The fossil beds at Wheeler High School, herein referred to as the "Fossil High" leaf beds, are shown as a small inlier of John Day Formation rocks surrounded by older Clarno Formation rocks on Robinson's (1975) large-scale reconnaissance map of the John Day Formation. Younger, tilted Miocene Columbia River Basalt flows overlie more steeply dipping strata of Clarno and John Day formations just west of Fossil, forming the northwest limb of a broad, east- to northeast-trending fold. The Fossil High leaf beds dip to the south. Where exposed, the local base of the John Day Formation north of Fossil is marked by thick-bedded, pumice-lapilli tuff as much as 200 m (600 ft) thick that is correlative with member "g" of the John Day Formation (Robinson, 1975). A rhyodacite flow overlies the lapilli tuff north of Fossil (Robinson, 1975).

The Fossil High leaf beds are exposed on the south side of a 15 m (50 ft) high northeast-trending ridge located at the north end of the high school football field. The ridge is here referred to as the "gun club ridge" (Figures 1 and 2). The gun club ridge is separated from the main mass of the John Day Formation to the north by landslide- and colluvium-mantled low hills and by ridges of tilted and deeply eroded lava flows. A speculative north-northeast trending fault separates the ridge from lava flows of the Clarno Formation on the west.

Exposures of leaf beds on the gun club ridge extend over an area of about 0.012 km^2 (3 acres) on Wheeler County School District property (Figure 2). Excavation sites are scattered along the steep, south side of the gun club ridge and extend upslope to a fence line that runs east-west beneath the crest of the ridge. Spoil from past digs mantles the slope and obscures the extent of excavated ground. An alkali basalt flow crops out along the south face at the east end of the gun club ridge and can be traced westward along the ridge crest, north of the fence line. The lava flow underlies the fine-grained, fossil-bearing sedimentary rocks. Rounded basalt and rhyolite clasts scattered along the contact suggest that a thin gravel layer separates the fossil-bearing rocks from the lava.

Manchester and Meyer (1987) showed that the fossil leaf beds are layered strata with apparent dips to the southwest. Beds in pits (Figure 3) open in 2004 have strikes ranging from N 84° W to N 86° E with dips of 20°–30° S.

Along the south side of the gun club ridge, most of the current dig sites are in thin-bedded, tuffaceous siltstone or fine-grained sandstone. Plant fossils occur along bedding planes in gray or grayish-white siltstone. Although not enough material is exposed to be certain, it appears that leaf-bearing layers are relatively thin and form fossil-rich zones less than 0.3 m (1 ft) thick. Exposures are insufficient to determine if excavations exploit fossil-rich horizons or a single fossil-rich horizon offset by small faults. Manchester and Meyer (1987) noted that the beds are cut by many vertical fracture planes, which may indicate that the Fossil High leaf beds are disrupted by small faults.

Figure 1. View northwest from the Wheeler High School football field to "gun club ridge" in Fossil, Oregon. The discovery site for the "Fossil High" leaf beds was located near the upper right hand corner of the white building.

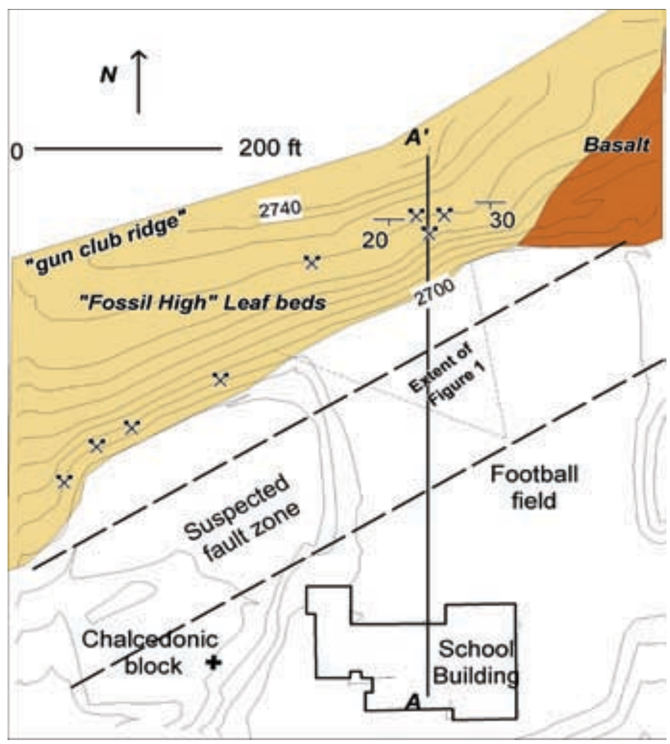

Figure 2. Geologic sketch map of the south flank of the "gun club ridge" near Wheeler High School, Fossil, Oregon, showing "Fossil High" leaf beds in tan and underlying lava flow in brown. Strike and dip symbols indicate slope of beds; prospect symbols indicate recent excavations. Location of suspected fault zone shown by heavy dashed lines, field of view of photo in Figure 1 shown by fine dashed lines. Contours at 1.6 m (5 ft) intervals were provided by Rowall Brokaw Architects, Eugene, Oregon.

(Leaf beds, continued from page 35)

At the east end of gun club ridge the Fossil High leaf beds overlie a weathered alkali basalt flow (Figures 2 and 4), which is approximately 20 m (60 ft) thick in a nearby water well (Figure 8, well WHEE-50122). Similar appearing tuffaceous siltstone beds with leaf fossils were found on strike overlying a lava flow 600 m (1800 ft) to the east, at the Wheeler County Waste Transfer Facility. Although the base of the lava flow is not exposed on the school property, the flow at the Wheeler County Waste Transfer Facility overlies massive claystone. It is unclear as to whether the claystone is part of the John Day Formation or, as mapped by Robinson (1975), is part of the underlying Clarno Formation. Retallack and others (1996) showed a thick sequence of claystone, with interbedded mafic lava flows, beneath the "Slanted Leaf Beds" elsewhere in the John Day Formation.

Because the rocks that overlie the Fossil High leaf beds have been removed by erosion or faulting along the gun club ridge, the true thickness of the beds cannot be determined. The leaf fossils may have been overlain at some time by a pumice lapilli tuff that marks the base of the John Day Formation north of Fossil (Robinson, 1975). The sandstone-siltstone dominated unit with the leaf fossils apparently becomes coarser grained up-section. Overlying, coarser-grained, tuffaceous sandstone beds exposed on the west end of the gun club ridge contain desiccated woody material (note that the log of well WHEE-50122, Figure 8, shows 12 m [35 ft] of "coal-like rock" overlying the alkali basalt, perhaps correlative with the woody strata). If the Fossil High leaf beds were formed by the same processes that formed the "Slanted Leaf Beds" in the John Day Fossil Beds National Monument, the leaf beds are probably about 15 m (50 ft) thick.

Figure 3. Plant fossils are found in white to gray, fine-grained tuffaceous siltstone and fine-grained sandstone of the "gun club ridge" behind Wheeler High School, Fossil, Oregon, that here dip to the south. Discarded siltstone fragments are fossiliferous. Rock hammer for scale.

CORRELATION

The Fossil High leaf beds are one of several sites from which the distinctive Bridge Creek flora have been collected (Manchester and Meyer, 1987). The Bridge Creek flora sites are included within the middle Big Basin Member of the John Day Formation as defined by Bestland and others (2002). In addition to flora similarities, correlation is based on radiometric ages of associated ashes. McIntosh and others (1997) reported a $^{40}Ar/^{39}Ar$ date of 32.58 ± 0.13 Ma from sanidine crystals in the fossil-bearing tuffaceous shale in the Fossil High leaf beds. This age date is consistent with other age dates from the Bridge Creek flora site in Painted Hills Unit of the John Day Formation, including 31.8 Ma and 32.3 Ma K-Ar ages (Evernden and others, 1964; Manchester and Meyer, 1987) and 32.99 ± 0.11 Ma and 32.66 ± 0.03 Ma $^{40}Ar/^{39}Ar$ ages (Retallack and others, 1996). Bestland and others (2002) reported a slightly older 33.6 ± 0.19 Ma $^{40}Ar/^{39}Ar$ date from the "Slanting Leaf Beds" in the John Day Fossil Beds National Monument Clarno Unit.

STRUCTURE

Preliminary site development plans assume that the Fossil High leaf beds continue to the south, beneath the north end of the existing football field. Whether there are any deposits accessible at reasonable depths depends on the structure of the leaf beds and the shape of the prefill slope beneath the football field.

The foot of the gun club ridge west of the football field is fairly steep, and therefore the fill is probably close to 3 m (10 ft) thick against the foot of the slope. The log of well WHEE-50122 indicates that soil cover is at least 3 m (10 ft) thick in the eastern extension of the swale occupied by the football field, so it is likely that any Fossil High leaf beds beneath the football field are at least 6 m (20 ft) deep.

The situation is complicated by the likely structure of the beds. There are two possible models. In one model the beds are simply tilted; in the other model the beds are tilted and faulted. The measured dip (tilt) of the Fossil High beds along the gun club ridge ranges from 20° to 30° S (Figure 2). As shown in the cross section in Figure 4, this means that the beds beneath the high school will be approximately 60 m (200 ft) deep. Given the steepness of the slope, it is unlikely that any of the fossil beds underlie the football field at accessible depths, except perhaps at the very northern edge.

The structural model shown in Figure 4 assumes a constant tilt of the beds and no other change or interruptions. Although not seen in outcrop, fragments of silicified siltstone and fault breccia along the road at the west edge of the school property suggest that a northeast-trending fault (Figure 5) may extend between the gun club ridge and the high school building, following the course of the small swale. A large block of chalcedonic quartz exposed in the flat to the west and below the high school is evi-

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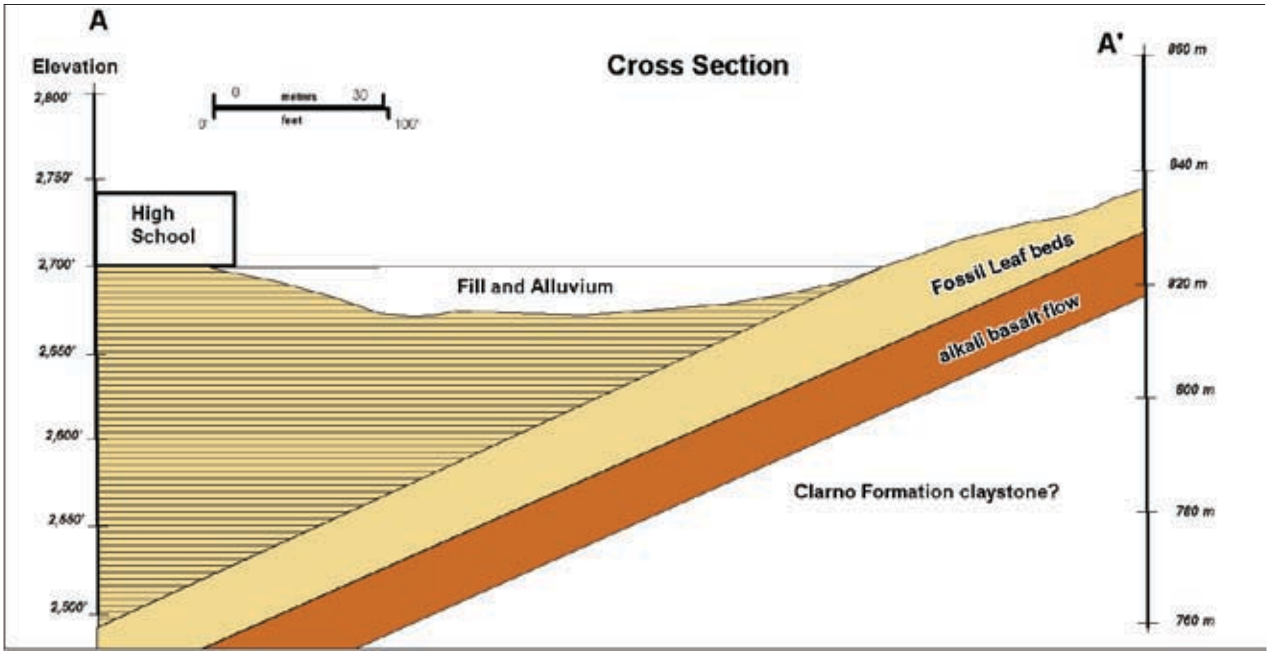

Figure 4. Cross section across the central part of the "gun club ridge" behind Wheeler High School, Fossil, Oregon, showing relationships between the "Fossil High" leaf beds (tan, no pattern) and underlying alkali basalt flow (brown) and overlying nonfossiliferous beds (tan with horizontal lines). Claystones beneath the alkali basalt are tentatively correlated with the Clarno Formation. The section is drawn such that the leaf beds are not faulted and are about 12 m (40 ft) thick. The number and thickness of individual fossil-bearing horizons within the leaf beds is not known. See Figure 2 for location of the A-A' section line.

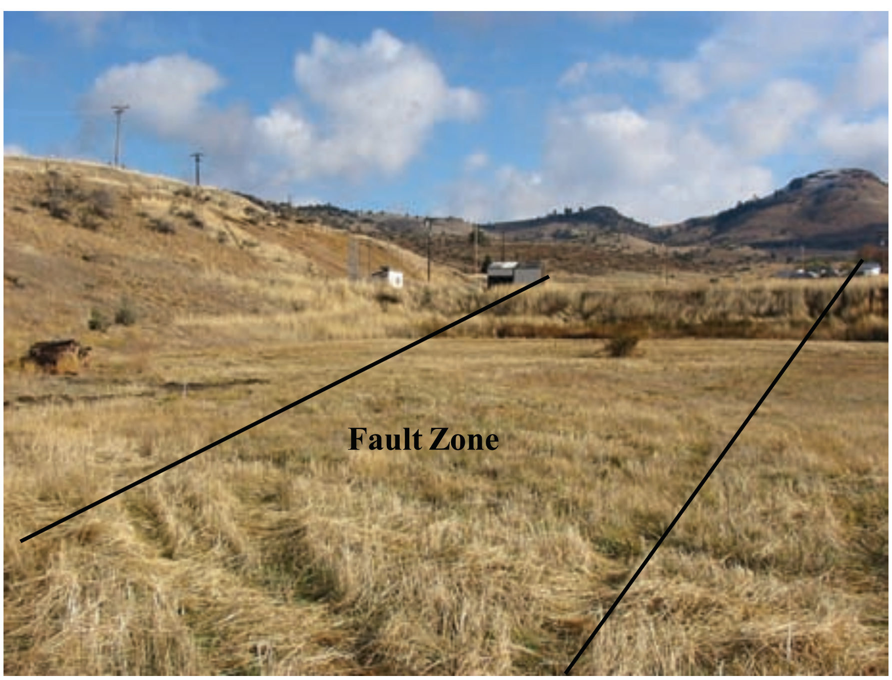

Figure 5. Looking northeast from the low area west of the Wheeler High School, Fossil, Oregon, football field and across the suspected fault to the face of the "gun club ridge."

dence of the type of hydrothermal alteration that is expected along a fault zone.

Figure 6 is a cross section showing the fault model. In this case, a fault zone cuts off the Fossil High leaf beds beneath the football field, and offsets the beds down on the south side to even greater depths than the tilted beds would have reached. In addition to making the beds deeper, the fault zone would likely disrupt the beds beneath the football field, again reducing the likelihood of finding a significant new fossil resource.

In order to test the fault hypothesis, we conducted a ground magnetometer survey in January 2005. Results of the survey (Figure 7) show a strong linear break between relatively highly magnetized rocks (red and orange) and less magnetized rocks (greens and blues) that coincides with the suspected fault trace. Basalt flows are typically strongly magnetic, while siltstone and sandstone are not, so this pattern suggests an abrupt edge to the basalt flow exposed in the gun club ridge. The magnetic pattern indi-

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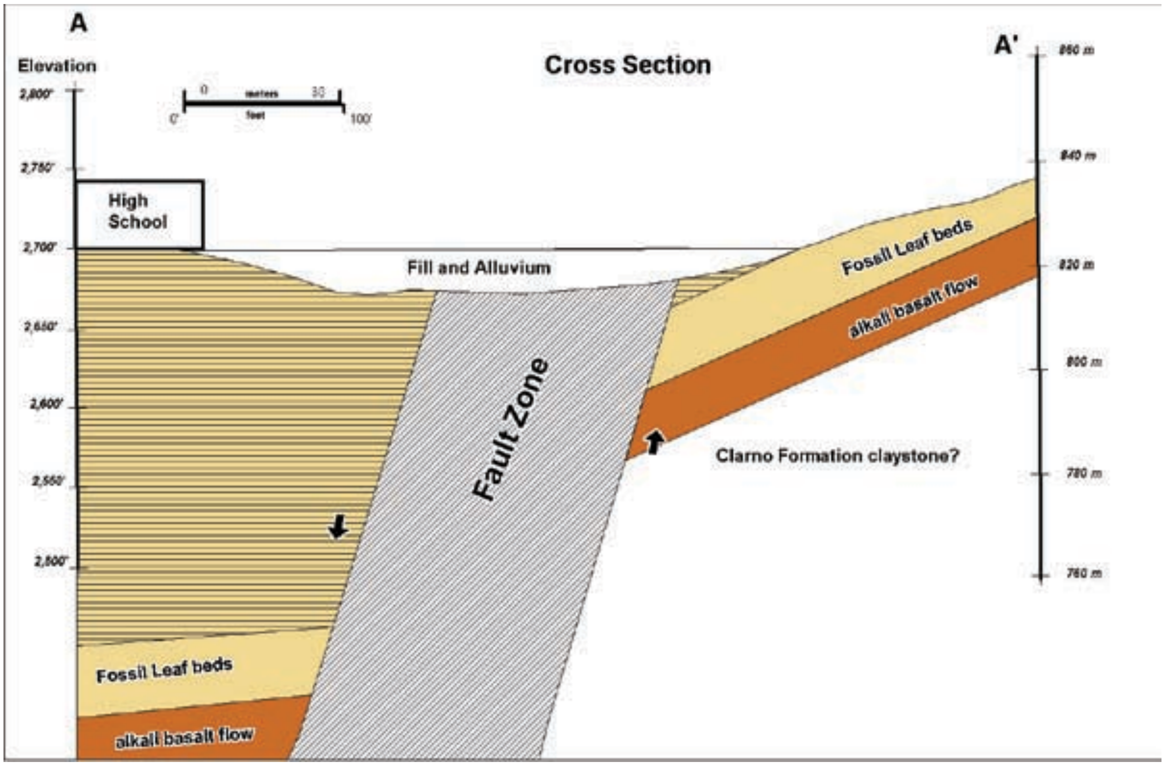

Figure 6. Cross section A-A' as in Figure 4, with a fault zone cutting off the "Fossil High" beds beneath the Wheeler High School football field. Line of section shown on Figure 2.

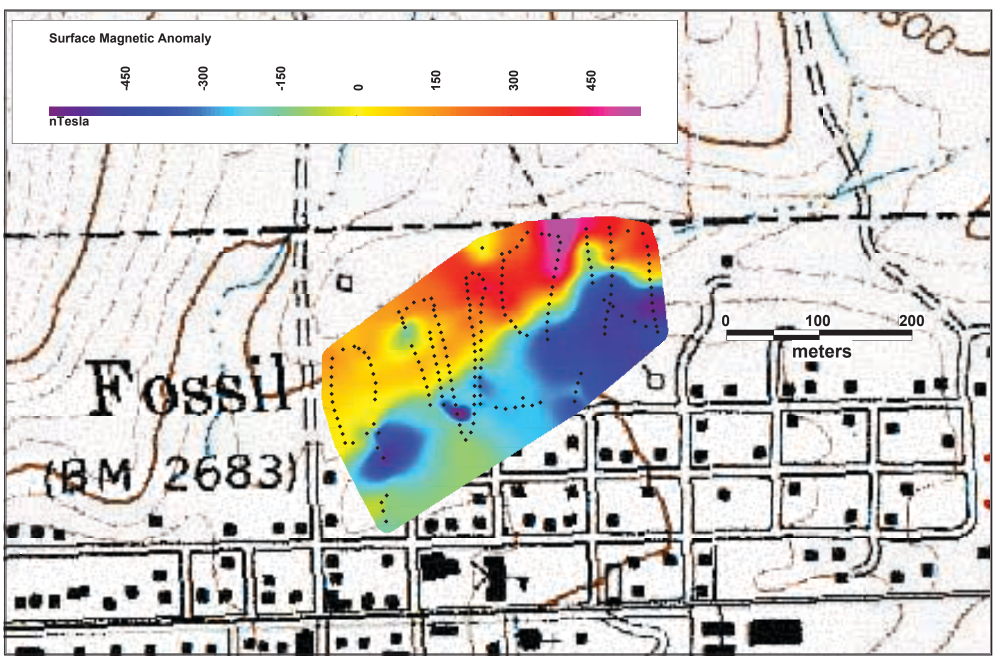

Figure 7. Ground magnetic anomaly map of the Wheeler High School area, Fossil, Oregon. Ground stations shown as black diamonds. More highly magnetized areas are shades of red and orange. Less highly magnetized areas shown in green and blue. Sharp break in color represents areas with strong magnetic gradients. Linear gradients such as this one are often associated with faults.

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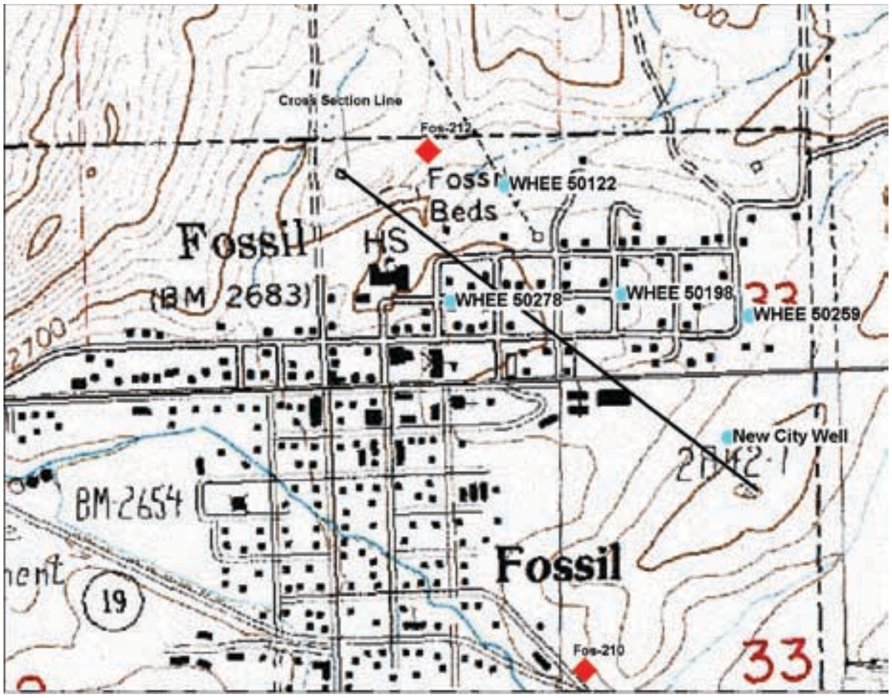

Figure 8. Map of the town of Fossil, Oregon. Water wells used to create the cross section in Figure 9 are blue dots, labeled with Oregon Water Resources Department log identification numbers, except new city well, which has no formal log yet. Red diamonds are locations of geochemically analyzed basalt samples (see Table 1). Base map is U.S. Geological Survey digital raster graphic (DRG) of the Fossil North 7.5′ quadrangle.

cates that a northeast-trending fault with substantial offset extends between the Fossil High beds and the high school building.

To further test the hypothesis that a fault cuts off the Fossil High beds, we located and interpreted the drillers logs of several water wells to try to build a geologic cross section through the town of Fossil. Figure 8 shows approximate locations of the wells used and the line of section that was chosen. The new Fossil city well was located by global positioning system coordinates as was well WHEE-50122. The remaining wells were located to the nearest city block by address. Figure 9 shows the interpreted cross section. In this model, the sequence of the Fossil High beds and the underlying alkali basalt and clay stone layers is broken into a northern block that is tilted to the south and a southern block that is tilted to the north. Geochemical analysis of the basalt (Table 1, Figure 8) from directly beneath the fossil beds, and from exposures just south of the fairgrounds indicates a high likelihood that the basalt flows are the same in both blocks. This model strongly supports the hypothesis that the Fossil High beds are cut off by a fault just north of the high school and raises the possibility that similar fossil beds may be present near the surface in the slopes south and east of the fairgrounds. Field reconnaissance around the fairgrounds indicated that tuffaceous sandstone and siltstone including some carbonized wood fossils are present.

The combination of field evidence at the high school and the strong linear magnetic gradient argue for the existence of a fault. The cross section derived from the water wells is consistent with the presence of a fault. In order to be absolutely certain that the Fossil High beds are cut off by a fault, further exploration in the form of deep excavations or drilling is needed.

Table 1. Geochemistry of basalt samples in Fossil localities; data not normalized.

Whole-Rock Major Element Oxides, wt. %												LOI*, wt. %
Sample†	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	
Fos-210	45.98	3.97	14.67	3.44	9.96	0.20	4.94	8.39	3.41	1.17	0.93	2.51
Fos-212	46.37	4.04	14.49	7.68	5.02	0.17	3.24	8.92	3.50	1.29	0.98	4.11

Trace Elements, parts per million																		
Sample†	Rb	Sr	Y	Zr	V	Ni	Cr	Nb	Ga	Cu	Zn	Co	Ba	La	Ce	U	Th	Sc	Pb
Fos-210	17	577	34	283	262	31	49	25	27	39	123	50	355	24	52	2	3	21	4
Fos-212	20	605	35	292	250	34	44	25	25	32	128	46	375	26	55	1	1	19	4

*LOI is loss on ignition.
†See Figure 8 for sample locations.

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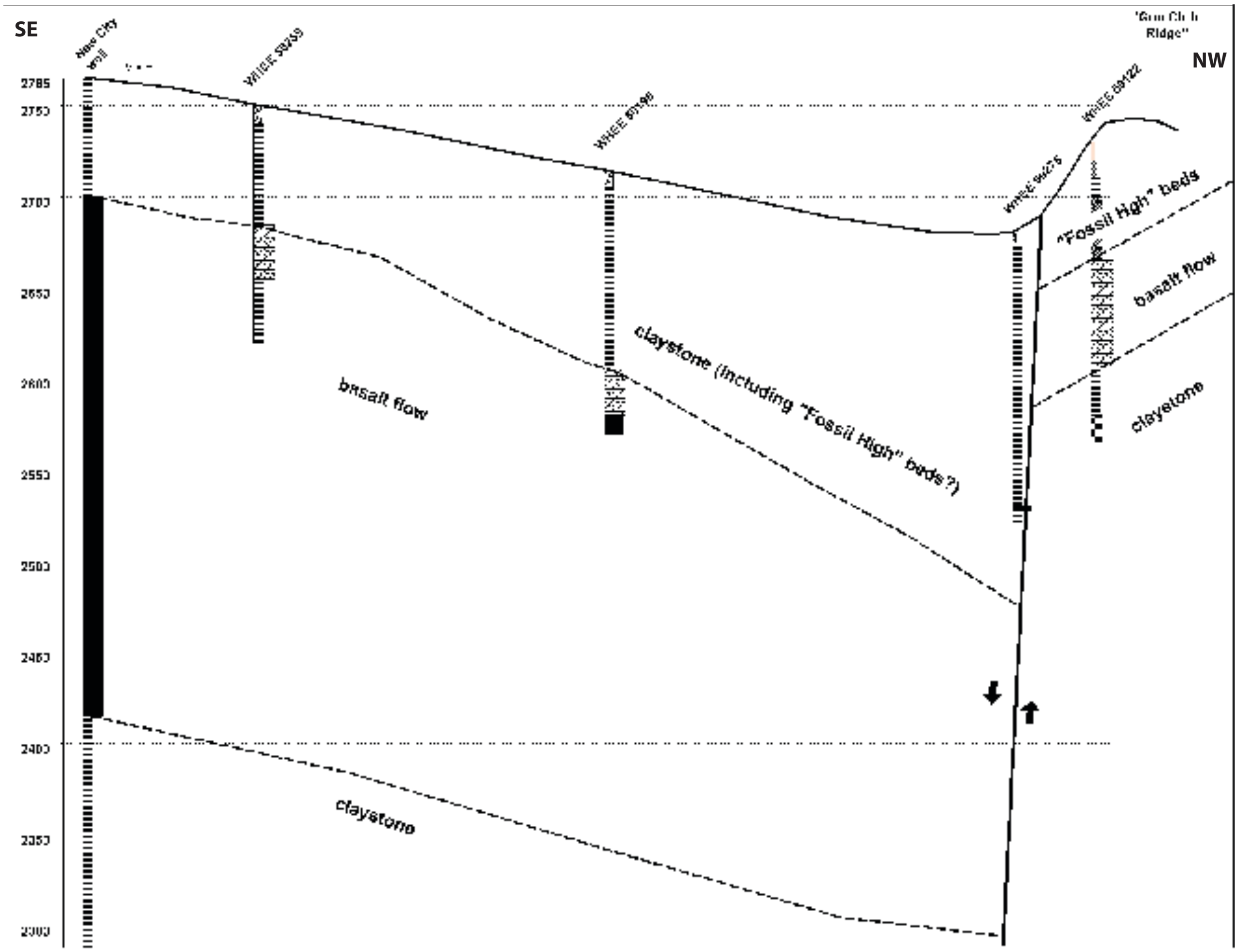

Figure 9. Geologic cross section from the new Fossil city well to "gun club ridge" behind Wheeler HIgh School. See Figure 8 for location of line. SE is southeast; NW is northwest.

DISCUSSION AND RECOMMENDATIONS

Our preliminary study suggests that the fossil resource in the Fossil High beds on the high school grounds is probably largely limited to the existing exposures along the gun club ridge. Discovery of a fault that very likely runs between the high school building and the gun club ridge means that the Fossil High beds cannot be expected to extend beneath the north end of the football field for any distance. Even if there is no fault, the relatively steep tilt of the beds means that they are likely to be inaccessibly deep on most of the school property.

Beyond the simple survey that we performed, a definitive answer to the extent of the Fossil High beds beneath the football field would require drilling a series of shallow (< 30 m [100 ft]) core holes in the northwest corner of the field. Although drill core would be more useful in determining the character of the fossil beds, information can obtained more cheaply by using a reverse-circulation drill rig that provides clean cuttings. Costs for core drilling can easily run several thousand dollars per hole, with substantial additional cost involved in analyzing and interpreting the core or cuttings.

The swale west of the football field could also be tested by drilling. Based on the way the Fossil High leaf beds dip to the south, the wood-bearing tuffaceous sandstone exposed on the west end of the ridge probably overlies the siltstone and fine-grained sandstone that contained the productive leaf-bearing horizons above the football field. However, as noted in the discussion of the fill and alluvium in the swale now occupied by the football field, there may be as much as 3 m (10 ft) of overburden covering fossil bearing beds in the swale.

Another issue to be addressed is whether more than one fossil-rich horizon occurs in the Fossil High leaf beds. This requires development of detailed stratigraphic sections and could be accompanied by 1) detailed mapping and trenching on the slope north of the football field or 2) detailed logging of drill core or cuttings. The cheapest approach would be to excavate a shallow backhoe trench

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down the face of the gun club ridge and then systematically map and log it. Trench excavation costs would be minimal, but logging would require several weeks of a geologist's time.

A detailed and systematic geologic survey of the City of Fossil and adjoining area might result in discovery of additional Birch Creek flora localities near town. In the limited time DOGAMI staff spent in the area, one additional leaf locality was found near the Wheeler County Solid Waste Transfer Facility. Indications of siltstone and some carbonized wood around the fairgrounds also suggest that further deposits might be located there.

A detailed geologic study would include field mapping and correlation of well cuttings, well logs, and surface outcrops. Preliminary steps to acquire and preserve data are being taken. At the time of the initial visit, a water well drilling rig was in the process of being set up at the county fairgrounds. Karen Masshoff was able to contact the driller and ensure that cuttings were saved for future examination. It is also important to note that most of the slopes in the area are mantled with colluvium (loose rock fragments mixed with clay and sand) and soil deposits many feet thick. This means that shallow excavations will be needed in most instances to uncover new deposits.

Costs for exploration for further deposits could range from relatively minor (a few days of surface mapping work, or backhoe trenches at the fairgrounds) to substantial (several diamond core holes at the high school). Given the strong evidence for a substantial fault at the high school, pursuing other local deposits may be a more cost-effective approach.

Despite the geologic limitations of the site, it is important to note that there remains a substantial amount of material in the currently known Fossil High beds. On the basis of our mapping of the site there are at least 437,000 cubic m^3 (680,000 yd^3) of material available if one were to excavate off the top 3 m (10 ft) of the deposit. This is equivalent to 68,000 standard dump trucks worth of material, and should last for decades with proper management. The slope will become dangerously steep long before the deposit is exhausted, so the real challenge for the future may be to manage the excavations and spoils. Spoils from past digging cover much of the slope, and removing and stockpiling the material may improve digging conditions. As the stockpiled spoils weather, they are likely to continue to yield fossils. An important part of managing the excavation would be to know whether the entire deposit was fossiliferous or just a few thin layers. In this case, a detailed stratigraphic study by trenching or drilling would be needed.

REFERENCES

Bestland, E. A., Hammond, P. E., Blackwell, D. L. S., Kays, M. A., Retallack, G. J., and Stimac, J., 2002, Geologic framework of the Clarno Unit, John Day Fossil Beds National Monument, central Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-02-03, 39 p.

Chaney, R. W., 1925, A comparative study of the Bridge Creek flora and the modern redwood forest: Carnegie Institution of Washington Publication 349, p. 1–22.

Evernden, J. F., Savage, D. E., Curtis, G. H., and James, G. T., 1964, Potassium-argon dates of the Tertiary floras of North America: American Journal of Science, v. 262, p. 945–974.

Manchester, S. R., and Meyer, H. W., 1987, Oligocene fossil plants of the John Day Formation, Fossil, Oregon: Oregon Geology, v. 49, p. 115–127.

McIntosh, W. C., Manchester, S. R., and Meyer, H. W., 1997, Age of the plant-bearing tuffs of the John Day Formation at Fossil, Oregon, based upon $^{40}Ar/^{39}Ar$ single-crystal dating: Oregon Geology, v. 59, p. 35.

Retallack, G. J., Bestland, E. A., and Fremd, T. J., 1996, Reconstructions of Eocene and Oligocene plants and animals of central Oregon: Oregon Geology, v. 58, p. 51–69.

Robinson, P. T., 1975, Reconnaissance geologic map of the John Day Formation in the southwestern part of the Blue Mountains and adjacent areas, north-central Oregon: U.S. Geological Survey Miscellaneous Investigations Map I-872, scale 1:125,000.

DOGAMI Agency News for 2007

—contributed by James Roddey, DOGAMI Earth Sciences Information Officer

STATEWIDE SEISMIC NEEDS ASSESSMENT

The big news at DOGAMI for 2007 is the completion and publication of the Statewide Seismic Needs Assessment (DOGAMI Open-File Report O-07-02). Presented to the Joint Subcommittee on Emergency Preparedness and Ocean Policy in May, the Statewide Seismic Needs Assessment, commissioned by the 2005 Oregon Legislature, catalogued and ranked the seismic safety of emergency and educational facilities across the state and included K–12 schools with more than 250 students, community colleges, acute care hospitals, county sheriff offices, city police, fire departments, and rural fire districts.

Assistant Director Don Lewis and Project Coordinator Natalie Richards (on loan from the U.S. Army Corps of Engineers) led a team that surveyed over 3,350 buildings, which were scored and ranked for probability of collapse in a maximum considered earthquake. Of the surveyed buildings, 1,280 schools (totalling 2,369 buildings), 143 city police and fire departments, and 191 rural fire protection districts were included in the report. The public schools assessed represent 97% of the total statewide enrollment for the 2005-2006 academic year. Survey team leaders included Bill Burns of DOGAMI, Carol Hasenberg of Portland State University, Tom Miller of Oregon State University, and Christine Theodoropoulos of the University of Oregon.

An interactive web site containing the complete report, building scores and background information is also online at http://www.oregongeology.com/sub/projects/rvs/.

Portion of the Pilot LIDAR Mapping Project - Portland, Oregon, Metro Area interactive web map (http://www.oregongeology.com/sub/lidar/) showing mapped landslides in Oregon City overlaid on LIDAR-derived shaded relief.

DOGAMI geologist Margi Jenks leads a field trip near Klamath Falls.

DOGAMI GOVERNING BOARD

Our Governing Board continues to be a strong guiding hand for the Department. The five-member Board consists of Chairman Don Haagensen of Portland, Co-chair Steve Macnab of Bend, Barbara Seymour of Oceanside, Vera Simonton of Pendleton, and R. Charles Vars of Corvallis, who was appointed in October. The Governing Board meets quarterly. This year, in addition to meetings in Portland, the Board met in Boardman, where water issues in northeast Oregon were discussed. Another Board meeting in Klamath Falls included an evening presentation by geologist Margi Jenks on the volcanic landscapes of the area that was attended by over 150 people. Two associated field trips also attracted large crowds.

MAPPING WITH LIDAR

DOGAMI's Light Detection and Ranging (LIDAR) program has grown substantially with the award of $1.5 million from the 2007 Oregon legislature via Oregon Watershed Enhancement Board (OWEB) research funds. DOGAMI uses LIDAR data to identify existing natural hazards like earthquake faults and landslides that normally are very difficult to detect in forested terrain, as well as to construct accurate, precise, and high-resolution hazard maps and risk assessments.

DOGAMI has formed the Oregon LIDAR Consortium (OLC; http://www.oregongeology.com/sub/projects/olc/), with the ultimate goal of providing high-quality LIDAR coverage for the entire state. Led by DOGAMI Chief Scientist Ian Madin, acquisition of new LIDAR data has begun. The first areas of interest are the inhabited portions of western Oregon with special emphasis on the Oregon coast.

From LIDAR data collected in the Portland metro area, DOGAMI has created an interactive web site using "bare earth" data that is searchable by street address. One can then compare and contrast these LIDAR images against aerial photographs, topographic maps, and older style 10-m digital elevation models (DEMs) derived from the topographic maps. Where earthquake and landslide haz-