INTRODUCTION

Purpose and Background

The purpose of preparing this treatise on the history of phosphate mining in the Idaho portion of the western phosphate field is two-fold. First, while there have been partial histories written before (Hansen, 1964, Service, 1967), neither covered the complete history of the field; and secondly, this paper was prepared in support of current on-going investigations in the phosphate field. Background material was gathered and research into the history of phosphate mining in southeastern Idaho was initiated while the author was working for the Conservation Division of the U. S. Geological Survey (USGS), 1972 to 1983. Research consisted of extensive bibliographic studies, examination of the field notes of "old-time" geologists, records of the Conservation Division, land and patent records of the Bureau of Land Management (BLM), and many interviews with long-experienced phosphate workers and mine superintendents.

After a basic, general discussion of the early history of the area and some of the early phosphate development problems, each mine is discussed in the order of initial development. The discussions include mine (or lease) ownership, history of prospecting and development, actual mining, and mine closure. Discussions of individual mine geology have been held to a minimum since the geology of the phosphate field has been extensively and expertly covered in many other papers. Also, there is very little discussion about the actual production of each mine. With the early, mostly private, mines, production statistics are not available, and with the later mines on Federal lands, the production is proprietary. Anecdotal information was used when available and appropriate to make the whole paper more readable.

Figure 1 is a generalized map of the eastern portion of Idaho and shows the relational location of the phosphate mines that are discussed in this paper. Plate 1 (in pocket) is a chronological time line showing each of the mines from the initiation of mining development to closure of the mine and how they individually relate to the development of the entire phosphate field in Idaho.

Early Exploration

From pioneer times to the present, southeastern Idaho has been the site of many ventures, adventures, expeditions and visitations. The area was originally the realm of the Shoshoni, Bannock and the Northern Paiute tribes of Native Americans. Although there was a continuous pattern of raid and rivalry between the Nez Perce and Shoshoni bands, the area was relatively peaceful. Starting in the early 1800's, explorers began encroaching from the east. John Jacob Astor's Astorians, under Wilson Price Hunt, entered what would become the Idaho territory as early as 1811, but did not reach southeast Idaho until 1813 while developing a route to the mouth of the Columbia River. They recognized the bountiful fur resources of the area and this attracted the mountain men and Indian traders to this peaceful corner of the world.

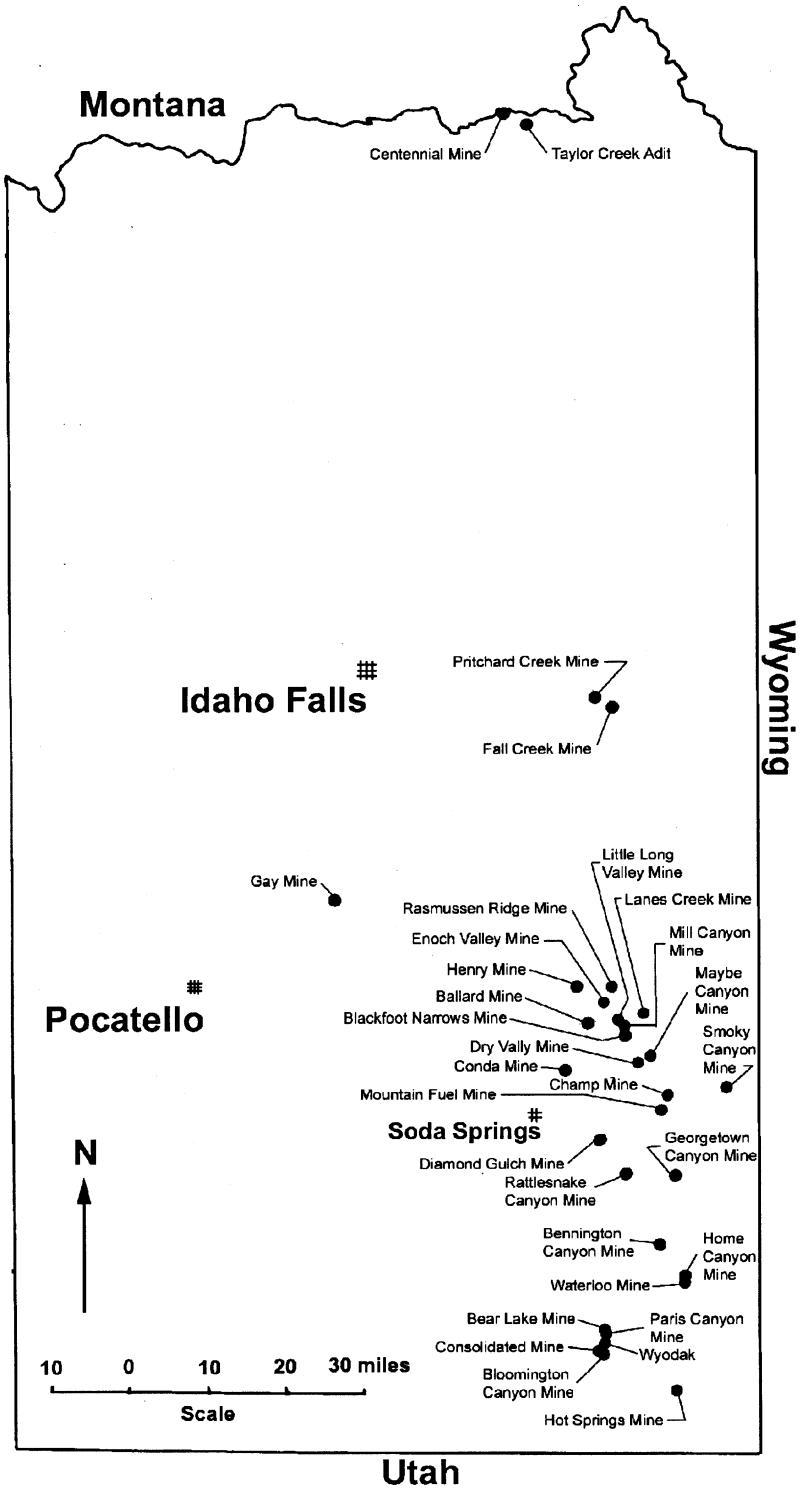

Figure 1. Generalized location map showing phosphate mines in southeastern Idaho.

In 1832-33, Captain Benjamin Louis Eulalie de Bonneville passed through the Bear Lake Valley on his way to the area near present-day Soda Springs and points beyond. Bonneville's party included hired and free trappers and Indians, an altogether colorful assemblage. Washington Irving (1849) in his biography of Bonneville relates the expedition's encounters with Indian raiding parties and buffalo hunting. Bonneville also described the area around "Beer Springs" (today known as Soda Springs).

In 1834, Nathaniel J. Wyeth, a Boston trader, led an expedition of trappers into the area and established Fort Hall as a trading post. Fort Hall was the first permanent American outpost west of the Continental Divide and functioned as a center of activity and commerce. Wyeth was also the region's first chronicler of geologic features, describing "strong volcanic appearance" and "streams that occupy what appear to be cracks of an overheated surface" (Peterson, 1994).

Starting about 1841 and continuing to 1870, emigrants on the Oregon Trail passed through Montpelier, Georgetown Summit and Soda Springs on their way to the Oregon Territory. This corner of today's Idaho was a highway for one of the greatest episodes of human migration. In 1843, John C. Fremont arrived in southeast Idaho and further solidified the route of the Oregon Trail. Fort Hall became a supply and rest point on the trail.

Gold was discovered in 1861 near Pierce, in north-central Idaho, and in 1862 in the Boise Basin. This had an immediate impact on southeast Idaho, as there was a large increase in traffic on the Oregon Trail as would-be miners traveled to the new discoveries.

Not all the people who migrated along the Oregon Trail were gold seekers; some stayed in this corner of Idaho. These settlers were primarily Mormons moving north from Utah into the fertile valleys of Bear Lake County and Old Bannock County (later divided into Bannock and Caribou Counties). Small communities, such as Franklin (1860) and Montpelier and Bennington (1864) lent a note of stability to the region. These towns turned into centers of ranching and farming.

Early Scientific Surveys

In the 1870's, this part of Idaho entered into another phase of exploration. Disenchanted miners from the California and northern Idaho gold fields had spread out into all corners of the territory to search for the elusive Eldorado. Gold was discovered in Caribou Basin in 1870, and prospectors covered all of southeastern Idaho in their quest for the yellow metal.

In the years 1871-1877, the first formal, scientific expedition visited southeastern Idaho. This was the famous Geological and Geographical Survey of the Territories, popularly called the Hayden Survey. Ferdinand Vandeveer Hayden led an assemblage of geologists, paleontologists, mineralogists, topographers, artists and photographers in exploring, mapping and documenting this part of the West (they also put Yellowstone on the map). One of the geologists, A. C. Peale, documented his many

findings of the geology and minerals of southeast Idaho in the annual reports of the Survey to Congress (Peale, 1879).

The Hayden Survey established the basic geologic framework for southeastern Idaho. Formations were discovered and described, geographic characteristics were identified, and some mineral deposits were discovered. However, even the scientific experts of this formidable expedition failed to recognize the one mineral that was to make southeast Idaho famous.

Discovery of Phosphate

With the passage of the Lode Law of 1866 and the Placer Law of 1870 and the later consolidation into the General Mining Law of 1872, mining claims were located in various places in southeastern Idaho. The claims were even being staked on phosphate rock, but not for phosphate. Those early claims were located mistakenly for either copper glance (chalcocite) or coal because of the black, earthy nature of phosphate. No one suspected that the black rock really was valuable for phosphate. Many of those claims were developed by prospects and in some cases, extensive tunneling. Of course, none of the intended minerals were found and the prospectors went elsewhere, leaving numerous pits and tunnels behind.

There is some controversy about when phosphate rock was finally recognized. Albert Richter, a prospector from Salt Lake City, claims to have recognized the phosphate deposits northeast of Ogden, Utah as early as 1889. He located claims and excavated a number of discovery pits (Richter, 1911). In 1897, R. A. Pidcock found some older workings on a black, soft formation in Rich County, Utah (Jones, 1907; Hansen, 1964). Thinking that he had found a gold mine, he located a number of claims and sampled the "ore." The samples were analyzed and were shown to contain no gold or silver, but did contain phosphoric acid in large amounts (32%). This was the first specific documentation of phosphate rock. At the time of the phosphate discovery, there was no market and no great "rush" occurred to stake out the deposit.

Charles Colcock Jones, a mining engineer from Los Angeles, California, working for the Mountain Copper Company, Ltd., examined Pidcock's discovery in 1903. Based on his knowledge and experience in the region, Jones recognized other phosphate deposits scattered throughout that part of Utah (Jones, 1907, 1913). In 1903, Jones heard of a deposit that was being worked for coal near Montpelier, Idaho. Upon examination of a 250-foot shaft found on the property, Jones determined that the "coal" was really the phosphate ore he had seen in Utah. In subsequent years, Jones went on to describe phosphate deposits near Hot Springs, Soda Springs, Bennington, and Bloomington, Idaho; Cokeville and Sage Station, Wyoming; and other areas throughout southeastern Idaho, southwestern Wyoming, and northern Utah (Jones, 1907, 1913).

Regardless of who should be given the credit of recognizing phosphate ore and the great extent of the phosphate formation, there remained one very large obstacle to developing the discovery, a viable market! Both Richter and Jones recognized the value of the ore for fertilizer, but at the turn of the

century there was no economical way to transport the ore to the fertilizer manufacturers in the East or on the west coast. Known phosphate deposits in Tennessee and the Carolinas were cheaply transported to eastern markets making the western phosphate field uneconomic. But times would change.

MINING CLAIMS AND PATENTS

After the value of the western phosphate was recognized (1889), mining claims were located specifically for the commodity throughout northern Utah, southeastern Idaho and southwestern Wyoming. The Lode Law of July 26, 1866 (14 Stat. 251) established the process for locating minerals contained in a "vein or lode of quartz, or other rock in place" that bore gold, silver, cinnabar, or copper. The Placer Act of July 9, 1870 (16 Stat. 217) amended the previous act to allow mining claims to be located for deposits "usually called "placers," including all forms of deposit, excepting veins of quartz, or other rock in place." The Mining Law of May 10, 1872 (17 Stat. 91) consolidated the two previous laws and broadened the scope of minerals that could be located under the law.

Practically speaking, a lode is formed by the deposition of metallic minerals from metal-rich solutions invading cracks and fissures in the host rock. The deposition is primarily a chemical process and secondarily a mechanical process. A placer deposit is usually a material that is derived from erosion and disaggregation of existing rock and deposition by either wind or running water (Weeks, 1908).

A problem quickly surfaced because the phosphate formation does not specifically fit the requirements of either the lode or placer provisions of the Mining Law. The phosphate ore is part of a sedimentary rock sequence that was deposited at the bottom of a shallow sea. The source of the phosphate is from chemical precipitation of organisms living in the sea. The bedded character of the phosphate rock doesn't fit the definition of a lode or placer deposit. This caused confusion as to the type of location that was appropriate for phosphate. The mining claims were located both ways, and, in some cases, top-filed as lode and placer claims by either the same or rival claimants.

Most locations for phosphate were filed as lodes, utilizing the "rock in place" definition contained in the Mining Law. But enough placer claims were located to bring the matter to litigation in the courts of the day, and concern in the halls of Congress.

As early as May 12, 1908, Congress recognized the problem in how to claim phosphate deposits. Congressman Franklin W. Mondell, R-WY, introduced a bill (H. R. 21873) to the 60th Congress, 2nd Session in an attempt to solve the conflict. The bill stated that phosphate was to be located as a placer claim, but grandfathered existing lode claims. The bill went on to eliminate the provisions of extra-lateral rights for the existing phosphate lode claims. A third provision of the bill resolved the conflict between phosphate lode and placer locations by establishing the concept of "first in time, first in right." Unfortunately, this bill ran into difficulty with supporters of the phosphate lode claimants and never made it out of committee.

In December, 1908, the Secretary of the Interior withdrew phosphate-bearing lands in the west from entry, bringing to a close the opportunity to locate mining claims for this commodity. This Secretarial withdrawal was later reinforced by the passage of the Pickett Act of June 25, 1910 (36 Stat. 847). The withdrawal was primarily in support of land classification which will be discussed at length later in this report. Phosphate mining claim locations that met all of the requirements and provisions of the Mining Law and were located prior to the effective date of the withdrawal remained in force and could be patented.

Shortly after the Secretary of the Interior withdrew the phosphate lands, Congress again became involved. On January 26, 1909, a bill was introduced in the Senate by Frank P. Flint, R-CA, that provided for the utilization and disposition of the phosphate deposits. This bill was of interest because it not only gave direction for the classification and restoration of the withdrawn lands, but it also outlined a leasing system for the federal phosphate deposits. The bill went on to remove extra-lateral rights from existing phosphate lode claims and required the Secretary of the Interior to reserve phosphate for the government in grants and patents for lands identified as containing phosphate. Apparently ahead of its time, the bill never got out of the Senate.

The Director of the USGS, George Otis Smith, in a letter to the Chairman of the Senate Committee on the Public Lands, endorsed another bill (Senate Bill S. 8609, February 9, 1909) which besides addressing the lode versus placer problem, also tried to establish the idea of "first in time, first in right." This bill also tried to ban the exportation of domestic phosphate. That particular clause probably doomed the bill, which never got out of the Senate.

The formal policy of the Department of the Interior was succinctly stated in a letter from Frank Pierce, First Assistant Secretary to the Honorable E. B. Critchlow, a judge in Salt Lake City, Utah, dated June 3, 1909. The letter stated:

> "*Scientific men differ upon the character and formation of these phosphate deposits. On account of this difference of opinion, I have announced that the claims could be patented under either act and the patents will be valid. If the first locations of the ground are under the placer act, placer patents will be issued. If, however, the first are under the lode act, lode patents will be issued. My point is, that the first locator, whether his location be made as a placer or as a lode, ought to and will be protected"*

While it was the stated opinion and policy of both the U. S. Congress and the Department of the Interior through 1910 that phosphate locations should be made under the placer laws, the first wavering of this conviction appeared early in 1911. In a February 9, 1911, House Committee on the Public Lands report on bill H. R. 31651, it was stated:

> *"It is the opinion of the Committee on the Public Lands that locations on lands valuable for their phosphate deposits should all have been made under the placer*

mining law, but it is not deemed wise to attempt to interfere with rights and claims asserted by original locators under the lode law; therefore the provision that in case of conflict between placer and lode locators on locations heretofore made, respective claims of the locators shall be determined as though locations as either placer or lode were valid at the time made."

During the period from 1911 through 1912, there were several bills introduced in both the Senate and the House that tried to establish the requirements for the classification and restoration of the phosphate withdrawals, and to establish the proper manner of the location and disposition of the phosphate deposits on Federal lands. All of the bills seemed to have problems and none became law.

The first litigation to address phosphate lode versus placer locations was in the District Court for Wyoming (*Morse S. Duffield and Lewis A. Jeffs v. San Francisco Chemical Co., Civ. Nos. 568, 569, D. Wyo., Jan. 15, 1912*). These names would become all too familiar in phosphate claim litigation. In these cases, the complainants (Duffield & Jeffs) held lode claims over the same ground where San Francisco Chemical Company (SFCC) had placer claims. The judge decreed in favor of the lode claimants in both civil actions. The decrees were appealed to the Eighth Circuit Court of Appeals (201 F. 830). Even though the placer locations were located two years earlier that the conflicting lode claims, the Appeals Court affirmed the lower Court's decision that the lode claims would prevail. Extensive discussion as to past case law and definitions of lode and placer deposits are contained in the Appeals Court decision.

The next suit to determine the correct way to locate claims on phosphate rock occurred in Bear Lake County, Idaho. In a case entitled *Duffield et al. v. San Francisco Chemical Company, September 3, 1912 (198 F. 942)*, SFCC located placer claims in 1904 and 1905 and were top-filed by Duffield and Jeffs' lode claims in 1907. The District Court essentially dodged the issue of lode versus placer and determined "first in time, first in right" of possession and found for the defendant, SFCC. This case was appealed to the Ninth Circuit Court of Appeals (205 F. 481). After a discussion of the character of the phosphate deposit and the jurisdictional responsibilities, the Appeals Court reversed the lower Court decision and again found for the lode claimants.

The next litigation appeared before the Secretary of the Interior in a Public Land Decision of December 12, 1912 (41 L.D. 403). In this case, a patent was applied for a lode claim located on phosphate rock in Utah. The entrymen in this case were Duffield and Jeffs. The patent application proceedings were adjudged to be regular in all respects with the only question being as to the patentability of the land and under which set of rules to patent, lode or placer. The Secretarial decision in this case was that the deposit should be patented under the lode provisions of the Mining Law. But in arriving at that decision, the case attempted to define what constitutes a lode. Several citations are made as follows: *Stevens v. Williams (1 McCrary 480, 488)* held that, "In general, it may be said, that a lode or vein is a body of mineral or mineral body of rock, within defined boundaries, in the general mass of the mountain." In *Hayes et al. v. Lavagnino (53 Pac., 1029)*, the court noted, "the term "vein" and "lode" apply to all deposits of mineralized matter within any zone or belt of mineralized rock separated

from the neighboring rock by well-defined boundaries." And finally, in *Beals v. Cone (62 Pac., 948, 953)*, the court stated, "a vein is a continuous body of mineral-bearing rock in place, in the general mass of the surrounding formation."

Building on the above case, the Department decision established two things:

> *"A mineral deposit in vein or lode formation-in place in the general mass of the mountain-whether the mineral it bears be metallic or nonmetallic, is subject to disposition only under the provisions of the lode mining laws."*

Secondly:

> *"A deposit of phosphate rock confined between well-defined boundaries constitutes a vein or lode of mineral-bearing rock in place and is subject to disposition only under the provisions of the lode mining laws."*

In light of the Department and District Court decisions discussed above, Congress again made attempts to resolve the issue. On April 8, 1913, Senate Bill S. 475 was introduced by Asle J. Gronna, R-ND. This bill attempted to establish a prospecting, leasing, and licensing system for developing federal phosphate. The bill outlined terms and conditions for prospecting permits and leases. The bill also established royalty and rental, bonding, and other leasing features. Again, the leasing concept was ahead of its time and the bill died in the Senate.

In a letter dated July 18, 1914, from A. A. Jones, First Assistant Secretary to the Honorable Scott Ferris, Chairman of the House Committee on the Public Lands, new department policy was stated:

> *"In the absence of remedial legislation these locations (placer) can not be passed to entry and patent. The only relief the Department, under the condition of the law as it now exists, is able to extend to such placer locators is to permit them after a modification of the outstanding phosphate withdrawal has been secured to re-form their locations or make new locations under the lode-mining laws, and thereupon to proceed to entry and patent. Prior to 1912, it was the practice of the Department to permit locations under either the lode or the placer-mining laws to pass to patent, but consideration of the Harry Lode mining claim decision, and the position of Federal Courts preclude further pursuit of such a practice."*

Because of the continuing confusion of phosphate lode vs. placer claims and all the litigation and the potential for further court actions, Congress finally stepped in and validated placer locations for deposits of phosphate rock. Senator Reed Smoot, R-UT, introduced Senate Bill S. 6106 on July 23, 1914. The bill simply validated all of the outstanding placer claims with no qualifications or extra features. The House of Representatives, after minor changes, approved the Bill and it became law as 38 Stat. 792b on January 11, 1915. On March 31, 1915, the Secretary of the Interior issued

authorization to process patents for phosphate placer locations under the placer rules of the Mining Law, thereby bringing to a close the contest between phosphate lode and placer claims.

Congress again entered into the phosphate picture and, on February 25, 1920, passed the Mineral Leasing Act (41 Stat. 437). This act removed certain minerals, including phosphate, from the provisions of the Mining Law of 1872 and created a leasing system for mining these minerals. The act also established a royalty system that would create income for the Federal government. Section 37 of the act provided that mining claims for phosphate (and other Leasing Act minerals) that were properly located and maintained under the Mining Law would remain under the requirements of that law until final disposition, patent or relinquishment. In fact, several phosphate mining claims were patented after the passage of the Leasing Act. Phosphate remains under the provisions of this act today.

PHOSPHATE WITHDRAWALS, CLASSIFICATIONS AND RESTORATIONS

During the period from 1890 to about 1915, a movement started to protect and conserve the resources on the public lands, particularly those in the west. This movement was known as the "conservation crusade" (Brunelle, 1978). The administrations of Theodore Roosevelt (1901-1909) and William Howard Taft (1909-1913) were the focus of this trend.

Several laws that dealt with resources on the public lands were passed. These included the designation of forest reserves (1897), the Reclamation Act of 1902, the creation of the first National Monuments (1906), the Antiquities Act of 1906, the Enlarged Homestead Act of 1909 (reserved minerals to the government), the Pickett Act of 1910 (giving the Executive the power to withdraw public lands from entry), the Stock-Raising Homestead Act of 1916 (reserving mineral rights), and the mineral leasing acts of 1917 and 1920.

On December 9, 1908, Secretary of the Interior James Rudolph Garfield issued a Secretarial Order to the Commissioner of the General Land Office, Fred Dennett. The Order read:

> *"In aid of proposed legislation affecting the disposal of phosphate deposits in the public lands of the United States, all the public lands embraced in the attached list, which have been reported as containing such deposits, are hereby withdrawn from all forms of location and disposal under the public-land laws, subject, however, to valid existing rights, and you are directed to take appropriate action hereunder."*

The Secretarial Order created a "temporary" phosphate reserve of 4,541,300 acres in Idaho, Utah and Wyoming. These lands had been identified by the USGS as either containing or having the potential for phosphate deposits. This secretarial withdrawal was done under the guise of "implied executive authority." There were three further secretarial withdrawal actions in 1908 and 1909 that added approximately 460,558 acres to the phosphate reserve, bringing the total to approximately 5,001,858 acres. The underlying reasons for these withdrawal actions were not only to support developing

legislation, but to protect the phosphate resource from appropriation under the Homestead laws and the Mining Law of 1872. (Under the Mining Law, 23 lode claims for phosphate involving about 440 acres and 43 placer claims for phosphate involving about 6,050 acres were patented in Idaho (Brunelle, 1978).) There was also a need to protect the phosphate resource from unscrupulous developers. Another underlying reason for this withdrawal was to give the USGS time to investigate the phosphate resource and classify the withdrawn lands as either "mineral" or "non-mineral" in character.

Because the secretarial orders withdrew the phosphate lands from all forms of entry and appropriation, Congress tried to find ways that the withdrawn lands could be freed of those restrictions. On January 19, 1909, Senator Reed Smoot, R-UT, introduced a bill (S. 8609) that required the Secretary of the Interior, after examination and classification by the USGS, "to restore to entry, selection and location, such of these lands as he may deem may to so restore without prejudice to the interests of the United States." The bill also required the Secretary to appoint a commission to clear title of the lands classified as phosphate lands of all entries, claims and locations and to test the validity of those claims.

While this bill did not become law, it did provide the secretary the idea to create a group of experts to classify the withdrawn lands. To accomplish this task, the USGS formed the Land Classification Board on December 18, 1908 as a section of the Geologic Branch. The Board was not only charged with the responsibility to classify the lands but also to make appropriate recommendations of revocation and restoration to the General Land Office.

During this time, there were four restorations of these temporary reserves. Approximately 2,326,950 acres in Idaho, Utah and Wyoming were restored without classification as the land did not contain any possibility for phosphate resources.

On June 25, 1910, President Taft signed into law the Pickett Act (36 Stat. 847). This act gave the executive the power to withdraw public lands to protect the public interests. Specifically, this act was limited to coal, oil, gas, and phosphate resources. Metallic minerals were excluded. The Act of August 24, 1912 (37 Stat. 497) amended the Pickett Act by extending withdrawal authority to all non-metalliferous minerals.

One of the underlying and fundamental reasons for the need for executive withdrawal powers was to protect the western phosphate resources from foreign acquisition. The eastern phosphate deposits in Tennessee and the Carolinas were owned or controlled by European companies and most, if not all, of that ore was being exported for the use of European farmers (Brunelle, 1978). It was widely recognized that domestic sources of phosphate for domestic fertilizer manufacture and use was vital to the development of this country, and that we should not be dependant on European suppliers (principally German).

Under the Pickett Act as amended, Presidents Taft and Wilson withdrew approximately 2,595,000 acres in Idaho, Utah and Wyoming (1910-1917) and formally created the western phosphate reserve.

These withdrawn lands included and formalized the lands that remained temporarily withdrawn under the existing secretarial orders.

As with the preceding withdrawals, the USGS was charged with the responsibility to investigate the lands for phosphate resources, to classify the lands as to their phosphate content, and to recommend specific restorations to the General Land Office. The original phosphate withdrawals were based on the best information and maps of the day, that is, the maps generated by the Hayden Survey in 1877. While those maps were an amazing compilation of information about the geology and mineral resources of eastern Idaho, western Wyoming and northern Utah, they were not specific enough to provide detailed information about the phosphate deposits. Remember that phosphate rock was not recognized as a resource until about 1889, well after the Hayden Surveys. Specifically, the Hayden maps showing Paleozoic rocks were used to withdraw entire townships for phosphate (Hansen, 1964).

Because the Pickett Act withdrawals were from all forms of entry except valid mining claims, serious problems developed concerning homestead and other agricultural entries. Even State selections under the in lieu selection provisions of the State Admissions Act (26 Stat. 215) excluded the phosphate withdrawals. The problems with state selections of in lieu lands were resolved with the passage of the Act of February 27, 1913 (37 Stat. 687) that gave the State of Idaho the right to select lands within the withdrawn area with the phosphate reserved to the United States. The passage of the Act of July 17, 1914 (38 Stat. 509) resolved the issue concerning agricultural entries on withdrawn phosphate lands by splitting the mineral estate from the surface estate and reserving the phosphate (and selected other minerals) to the United States.

All of this meant that there was a tremendous job ahead for the USGS to identify the western phosphate resources. Starting about 1909 and extending to World War I in 1914, USGS geologists initiated extensive and detailed studies of the phosphate rock deposits of the withdrawn area (Mansfield, 1927). These studies included mapping, trenching, sampling, and eventually the classification of the phosphate. The Phosphoria Formation (Richards and Mansfield, 1912) was discovered to be wide-spread and relatively consistent in its phosphate content and quality. Figures 2 and 3 show typical trenches hand dug in 1916 that exposed fresh phosphate rock for sampling and analysis. Table 1 lists the published locations of the USGS trenches, prospects, pits, tunnels, and drill holes for the periods of pre-1924, 1938-1963, and 1970-1985.

For a short time after WWI, the USGS resumed its studies of the withdrawn area. Between 1920 and about 1942, there was little field work in the western phosphate reserve. This was a period of classification actions and publication of previous field studies. Beginning about 1942, a renewed interest in the reserve started, not for phosphorous, but for vanadium, and, in 1947, the uranium content of the phosphate ore (Montgomery and Cheney, 1967). As a result of this vanadium-uranium interest in the 1940's and 1950's, more classifications of the phosphate withdrawals as mineral or non-mineral were made with resulting restorations of the withdrawn lands. Table 1, part 1938-1963, lists the published locations of the trenches and drill holes from this phase of the phosphate reserve study.

Figure 2. USGS phosphate prospect in SE¼ Section 34, T. 4 S., R. 40 E. (Cranes Flat Quadrangle). Fred (right) and Lewis Campbell, teamster and cook respectively, September 1, 1916. Photo by G. R. Mansfield, #327, USGS Photographic Library.

Figure 3. P. V. Roundy in trench, Fred and Lewis Campbell, NE¼ Section 30, T. 5 S., R. 40 E. (Portneuf Quadrangle), September 7, 1916. Photo by G. R. Mansfield, #330, USGS Photographic Library.

Table 1. - USGS phosphate trenches, prospects, pits, tunnels, and drill holes.

Pre-1924

Trench, Prospect or Tunnel	Township, Range	Section/Subdivision	Year	Reference
prospect	T. 4 S., R. 37 E.	NW¼NE¼ Section 11	?	USGS Bull. 713, p. 86
trench	T. 5 S., R. 37 E.	NE¼NE¼ Section 13	1913	USGS Bull. 803, p. 71; USGS Bull. 713, p. 91
trench and 6 prospect pits	T. 5 S., R. 38 E.	NE¼SE¼ Section 36	1913	USGS Bull. 803, p. 70; USGS Bull. 713, p. 103
trench	T. 1 S., R. 39 E.	NW¼ Section 29	1913	USGS Prof. Paper 238
prospects	T. 1 S., R. 39 E.	NW¼NW¼ Section 30	1913	USGS Prof. Paper 238
prospects	T. 1 S., R. 39 E.	NE¼SE¼ Section 31	1913	USGS Prof. Paper 238
trench	T. 1 S., R. 39 E.	NE¼SE¼ Section 33	1913	USGS Prof. Paper 238
trench	T. 2 S., R. 39 E.	NW¼NW¼ Section 22	1913	USGS Prof. paper 238
prospect	T. 5 S., R. 39 E.	NE¼SW¼ Section 31	<1913	USGS Bull. 803, p. 75
prospect	T. 5 S., R. 39 E.	NW¼SE¼ Section 31	<1913	USGS Bull. 803, p. 76
trench	T. 6 S., R. 39 E.	NW¼ Section 17	1923	USGS Bull. 803, p. 79
trench	T. 6 S., R. 39 E.	NE¼ Section 18	1923	USGS Bull. 803, p. 79
trench	T. 4 S., R. 40 E.	SE¼SE¼ Section 34 (see Figure 2)	1916	USGS Prof. Paper 238; USGS Bull. 803, p. 84; USGS Prof. Paper 152, p. 221
prospects	T. 5 S., R. 40 E.	SE¼NW¼ Section 30	1916	USGS Bull. 803, p. 76
trenches (4)	T. 5 S., R. 40 E.	SE¼NE¼ Section 30 (see Figure 3)	1916	USGS Bull. 803, p. 82; USGS Prof. Paper 152, p. 223
prospect	T. 6 S., R. 40 E.	NE¼ Section 30	1916	USGS Prof. Paper 152, p. 226
trench	T. 4 S., R. 41 E.	SE¼SE¼ Section 20	1916	USGS Prof. Paper 152, p. 227
trench	T. 4 S., R. 41 E.	NE¼SE¼ Section 32	1916	USGS Prof. Paper 152, p. 227
trenches (3)	T. 5 S., R. 41 E.	SE¼SE¼ Section 19	1916	USGS Prof. Paper 152, p. 228
trench	T. 6 S., R. 41 E.	NE¼NE¼ Section 30	1916	USGS Bull. 803. p. 87-88; USGS Prof. Paper 152, p. 229
trench	T. 5 S., R. 42 E.	NW¼SE¼ Section 29	1916	USGS Prof. Paper 152, p. 231
trench	T. 6 S., R. 42 E.	NE¼SE¼ Section 10	1912	USGS Prof. Paper 152, p. 232
Anaconda tunnel	T. 8 S., R. 42 E.	NE¼SE¼ Section 15	1920	USGS Prof. Paper 152, p. 235

Trench, Prospect or Tunnel	Township, Range	Section/Subdivision	Year	Reference
prospect	T. 8 S., R. 42 E.	SE¼SW¼ Section 23	1910	USGS Bull. 470, p. 405
prospects (2)	T. 6 S., R. 43 E.	NE¼SW¼ Section 16	<1912	USGS Prof. Paper 152, p. 240
prospects (3)	T. 6 S., R. 43 E.	NE¼NW¼ Section 26	1912	USGS Prof. Paper 152, p. 241
trench	T. 7 S., R. 43 E.	NE¼SW¼ Section 7	1912	USGS Prof. Paper 152, p. 242
trench	T. 8 S., R. 43 E.	E½E½ Section 12	1912	USGS Prof. Paper 152, p. 243
prospects (3)	T. 8 S., R. 43 E.	Lot 2, Section 31	1910	USGS Prof. Paper 152, p. 243; USGS Bull. 470, p. 412
prospects	T. 9 S., R. 43 E.	NW¼ Section 6	1910	USGS Bull. 470, p. 421
prospects	T. 9 S., R. 43 E.	SE¼SE¼ Section 17	1910	USGS Prof. Paper 152, p. 247; USGS Bull. 470, p. 421, 424
prospects	T. 9 S., R. 43 E.	SW¼NW¼ Section 17	1910	USGS Bull. 470, p. 421, 424
prospects	T. 9 S., R. 43 E.	SW¼ Section 21	1910	USGS Prof. Paper 152, p. 247; USGS Bull. 470, p. 421, 424
SFCC tunnel	T. 9 S., R. 43 E.	NE¼SE¼ Section 29	1910	USGS Prof. Paper 152, p. 245
SFCC tunnel	T. 9 S., R. 43 E.	NW¼SE¼ Section 29	1910	USGS Prof. Paper 152, p. 247; USGS Bull. 470, p. 422
prospects	T. 9 S., R. 43 E.	SW¼ Section 29	1910	USGS Bull. 470, p. 421
prospects, tunnel	T. 9 S., R. 43 E.	NW¼NW¼ Section 33	1910	USGS Bull. 470, p. 423-424; USGS Prof. Paper 152, p. 246; USGS Bull. 470, p. 388
prospects	T. 9 S., R. 43 E.	SW¼ Section 33	1910	USGS Bull. 470, p. 421
tunnel, prospects	T. 10 S., R. 43 E.	NE¼SE¼ Section 3	1910	USGS Prof. Paper 152, p. 248; USGS Bull. 470, p. 428
prospects	T. 10 S., R. 43 E.	Section 3	?	USGS Bull. 470, p. 427
prospect	T. 10 S., R. 43 E.	NW¼NW¼ Section 11	1910	USGS Prof. Paper 152, p. 249
tunnel	T. 10 S., R. 43 E.	NW¼NW¼ Section 11	1910	USGS Bull. 470, p. 428
tunnels (2)	T. 14 S., R. 43 E.	SE¼ Section 8	1913	USGS Prof. Paper 152, p. 252-253
Spomberg's tunnel	T. 14 S., R. 43 E.	SE¼NE¼ Section 21	<1910	USGS Prof. Paper 152, p. 252-253
prospects (2)	T. 14 S., R. 43 E.	SE¼SE¼ Section 21	<1910	USGS Prof. Paper 152. p. 252-253
prospect	T. 14 S., R. 43 E.	NW¼NE¼ Section 28	1920	USGS Prof. Paper 152, p. 252
prospects (2)	T. 7 S., R. 44 E.	SE¼NW¼ Section 9	1912	USGS Prof. Paper 152, p. 256

Trench, Prospect or Tunnel	Township, Range	Section/Subdivision	Year	Reference
prospect	T. 8 S., R. 44 E.	SW¼SW¼ Section 7	1910	USGS Bull. 577, p. 40; USGS Prof. Paper 152, p. 258
prospects (3)	T. 8 S., R. 44 E.	SW¼SE¼ Section 14	1911	USGS Bull. 577, p. 40; USGS Prof. Paper 152, p. 258
trench	T. 9 S., R. 44 E.	NW¼NE¼ Section 16	1911	USGS Bull. 577, p. 44; USGS Prof. Paper 152, p. 260
prospect	T. 10 S., R. 44 E.	NE¼SE¼ Section 25	<1911	USGS Bull. 577, p. 47; Prof. Paper 152, p. 262
trench	T. 10 S., R. 44 E.	NE¼SE¼ Section 25	1909	USGS Bull. 430, p. 487
tunnels (2)	T. 10 S., R. 44 E.	Superior Extension Claim	?	USGS Bull. 577, p. 48; Prof. Paper 152, p. 262
tunnel	T. 10 S., R. 44 E.	Highland #2 Claim	?	USGS Bull. 577, p. 48; Prof. Paper 152, p. 262
prospects (2)	T. 11 S., R. 44 E.	NW¼NW¼ Section 1	?	USGS Bull. 577, p. 51
prospects (2)	T. 11 S., R. 44 E.	SE¼SW¼ Section 1	<1910	USGS Bull. 577, p. 51-52; USGS Prof. Paper 152, p. 264
tunnel	T. 11 S., R. 44 E.	NW¼ Section 1	1909	USGS Prof. Paper 152, p. 266; USGS Bull. 430, p. 487
tunnel	T. 11 S., R. 44 E.	UF&CM Co. claim, Section 12	?	USGS Bull. 577, p. 52
tunnel	T. 11 S., R. 44 E.	UF&CM Co. claim, Section 12	?	USGS Bull. 577, p. 52-53
tunnels (2)	T. 11 S., R. 44 E.	UF&CM Co. claim, Section 12	?	USGS Bull. 577, p. 53-54
tunnel	T. 11 S., R. 44 E.	SW¼NW¼NE¼ Section 12	<1910	USGS Prof. Paper 152, p. 265
tunnel	T. 11 S., R. 44 E.	SW¼NE¼NW¼ Section 12	<1910	USGS Prof. Paper 152, p. 265
tunnels (2)	T. 11 S., R. 44 E.	SW¼SW¼NW¼ Section 12	<1910	USGS Prof. Paper 152, p. 265
prospects	T. 12 S., R. 44 E.	Section 14	<1909	USGS Prof. Paper 152, p. 267
North Lake tunnel	T. 15 S., R. 44 E.	NE¼SW¼ Section 12	<1912	USGS Prof. Paper 152, p. 270
tunnels (2)	T. 15 S., R. 44 E.	NW¼NE¼ Section 24	<1909	USGS Prof. Paper 152, p. 269; USGS Bull. 430, p. 496
trench	T. 10 S., R. 45 E.	SE¼ Section 7	<1912	USGS Prof. Paper 152, p. 273

Trench, Prospect or Tunnel	Township, Range	Section/Subdivision	Year	Reference
trench	T. 10 S., R. 45 E.	NW¼NW¼ Section 8	?	USGS Prof. Paper 313A
trench	T. 10 S., R. 45 E.	SE¼NW¼ Section 30	<1912	USGS Prof. Paper 152, p. 273-274
prospects	T. 12 S., R. 45 E.	Sections 30 & 31	<1912	USGS Prof. Paper 152, p. 277-279
prospects	T. 13 S., R. 45 E.	Section 6	<1912	USGS Prof. Paper 152, p. 280
trench	T. 8 S., R. 46 E.	SE¼NW¼ Section 29	1914	USGS Prof. Paper 152, p. 283-284

1938-1963

Trench, Tunnel or Drill Hole	Township, Range	Section/Subdivision	Year	Reference
drill hole	T. 4 S., R. 37 E.	Section 14	1948	USGS Circular 208, Lot #1279
drill hole	T. 4 S., R. 37 E.	Section 14	1948	USGS Circular 208, Lot #1280
trench	T. 4 S., R. 37 E.	Section 23	1951	USGS Circular 327, Lot #1349
trench	T. 6 S., R. 38 E.	NE¼ Section 1	1949	USGS Circular 305, Lot #1304
trench	T. 1 S., R. 39 E.	SE¼NW¼ Section 31	1950	USGS Circular 327, Lot #1322
trench	T. 6 S., R. 40 E.	SE¼ Section 12	1949	USGS Circular 305, Lot #1315
trench	T. 5 S., R. 41 E.	Section 20	1949	USGS Circular 305, Lot #1313
trench	T. 4 N., R. 42 E.	W½SE¼ Section 24	1963	USGS Bull. 1205, p. 109
trench	T. 6 S., R. 42 E.	SE¼ Section 10	1949	USGS Circular 305, Lot #1309
trench	T. 6 S., R. 42 E.	Section 24	1948	USGS Circular 301, Lot #1230
trench	T. 7 S., R. 42 E.	NW¼ Section 26	1948	USGS Circular 262, Lot #1262
crosscut, Conda Mine	T. 8 S., R. 42 E.	Section 13	1947	USGS Circular 208, Lot #1200
trenches (2)	T. 4 N., R. 43 E.	NW¼SW¼ Section 35	1961	USGS Bull. 1205, p. 105
trench (CP-7)	T. 1 N., R. 43 E.	SW¼SW¼ Section 6	1961	USGS Map MF-277
trench	T. 1 N., R. 43 E.	NW¼ Section 17	1947?	USGS OFR 76-577, p. 27
trench	T. 1 N., R. 43 E.	SW¼ Section 18	1950	USGS Circular 327, Lot #1338
trench	T. 5 S., R. 43 E.	Section 34	1949	USGS Circular 305, Lot #1308
trench	T. 7 S., R. 43 E.	NE¼ Section 10	1953	USGS Circular 375, Lot #1391
trench	T. 7 S., R. 43 E.	Section 24	1948	USGS Circular 262, Lot #1261
trench	T. 8 S., R. 43 E.	Section 1	1948	USGS Circular 208, Lot #1280

Trench, Tunnel or Drill Hole	Township, Range	Section/Subdivision	Year	Reference
trench	T. 8 S., R. 43 E.	SE¼ Section 23	1947	USGS Circular 301, Lot #1209
trench	T. 8 S., R. 43 E.	NW¼NW¼ Section 30	1947	USGS Circular 301, Lot #1206
drill hole	T. 9 S., R. 43 E.	Section 8	1948	USGS Circular 208, Lot #1274
drill hole	T. 9 S., R. 43 E.	Section 8	1948	USGS Circular 208, Lot #1275
drill hole	T. 9 S., R. 43 E.	Section 9	1948	USGS Circular 208, Lot #1276
trench	T. 9 S., R. 43 E.	NE¼SW¼ Section 29	1948	USGS Circular 208, Lot #1265
trench	T. 14 S., R. 43 E.	Section 8	1948	USGS Circular 262, Lot #1266
drill hole	T. 14 S., R. 43 E.	Section 21	1948	USGS Circular 262, Lot #1272
trench	T. 4 N., R. 44 E.	NE¼NE¼ Section 18	1938	USGS Bull. 944-A, trench E; USGS Bull. 1205, p. 107
trench	T. 4 N., R. 44 E.	NE¼ Section 22	1938	USGS Bull. 944-A, trench D
trench	T. 4 N., R. 44 E.	SW¼SW¼ Section 34	1947?	USGS OFR 76-577, p. 29
trench	T. 4 N., R. 44 E.	NW¼ Section 34	1938	USGS Bull. 944-A, trench F
trench	T. 7 S., R. 44 E.	Section 6	1948	USGS Circular 301, Lot #1233
trench	T. 7 S., R. 44 E.	Section 9	1948	USGS Circular 301, Lot #1232
trench	T. 7 S., R. 44 E.	Section 28	1948	USGS Circular 262, Lot #1258
trench	T. 7 S., R. 44 E.	Section 31	1948	USGS Circular 262, Lot #1259
trench	T. 8 S., R. 44 E.	NW¼NE¼ Section 10	1947	USGS Circular 208, Lot #1210
drill hole	T. 8 S., R. 44 E.	Section 30	1948	USGS Circular 208, Lot #1277
drill hole	T. 8 S., R. 44 E.	Section 30	1948	USGS Circular 262, Lot #1278
trench	T. 9 S., R. 44 E.	NE¼SE¼ Section 14	1947	USGS Circular 301, Lot #1211
trench	T. 9 S., R. 44 E.	NE¼SE¼ Section 19	1947	USGS Circular 301, Lot #1208
trench	T. 9 S., R. 44 E.	NE¼NE¼ Section 20	1947	USGS Circular 208, Lot #1212
trench	T.10 S., R. 44 E.	SE¼ Section 1	1948	USGS Circular 262, Lot #1264
trench	T. 14 S., R. 44 E.	SE¼ Section 36	1949	USGS Circular 304, Lot #1293
crosscut, Hot Sprg. Mine	T. 15 S., R. 44 E.	Section 13	?	USGS Circular 304, Lot #1317
trench	T. 2 N., R. 45 E.	W½ Section 27	1940	USGS Bull. 944-A, trench G

Trench, Tunnel or Drill Hole	Township, Range	Section/Subdivision	Year	Reference
trench	T. 8 S., R. 45 E.	S½ Section 21	1949	USGS Circular 304, Lot #1310
trench	T. 8 S., R. 45 E.	SE¼SE¼ Section 31	1949	USGS Circular 304, Lot #1306
trench	T. 8 S., R. 45 E.	SE¼ Section 33	1949	USGS Bull. 1217, Lot #1298 USGS Circular 304, Lot #1298
trench	T. 9 S., R. 45 E.	SW¼ Section 8	<1958	USGS Bull. 1217, Lot #1306A
trench	T. 9 S., R. 45 E.	SE¼NE¼ Section 32	1944	USGS Bull. 955-C, trench A; USGS Bull. 982-A, trench A
trench	T. 9 S., R. 45 E.	SE¼NE¼ Section 32	1944	USGS Bull. 955-C, trench B; USGS Bull. 982-A, trench B
trench	T. 9 S., R. 45 E.	SE¼NE¼ Section 32	1944	USGS Bull. 955-C, trench C; USGS Bull. 982-A, trench C
trench	T. 9 S., R. 45 E.	S½SW¼ Section 34	1948	USGS Circular 208, Lot #1268
trench	T. 9 S., R. 45 E.	SW¼SW¼ Section 34	1944	USGS Bull. 955-C, trench I; USGS Bull. 982-A, trench I
trench	T. 10 S., R. 45 E.	NW¼NE¼ Section 5	1944	USGS Bull. 955-C, trench D; USGS Bull. 982-A, trench D
trench	T. 10 S., R. 45 E.	NW¼NE¼ Section 9	1944	USGS Bull. 955-C, trench E; USGS Bull. 982-A, trench E
trench	T. 10 S., R. 45 E.	SW¼SW¼ Section 9	1944	USGS Bull. 955-C, trench F; USGS Bull. 982-A, trench F
trench	T. 10 S., R. 45 E.	SW¼SW¼ Section 9	1944	USGS Bull. 955-C, trench G; USGS Bull. 982-A, trench G
trench	T. 10 S., R. 45 E.	NE¼NW¼ Section 9	1944	USGS Bull. 955-C, trench H; USGS Bull. 982-A, trench H
trench	T. 10 S., R.45 E.	SW¼SE¼ Section 16	1953	USGS Circular 375, Lot #1392
trench	T. 10 S., R. 45 E.	NE¼NW¼ Section 30	1948	USGS Circular 262, Lot #1267
drill hole	T. 10 S., R. 45 E.	NE¼NW¼ Section 30	1949	USGS Circular 304, Lot #1320
trench	T. 10 S., R. 45 E.	NE¼NW¼ Section 30	1953	USGS Circular 375, Lot #1267A
trench	T. 12 S., R. 45 E.	Section 31	1947	USGS Circular 301, Lot #1207
trench	T. 3 N., R. 46 E.	Lot 4, Section 6	1938	USGS Bull. 944-A, trench C
trench	T. 1 N., R. 46 E.	SW¼ Section 6	1940	USGS Bull. 944-A, trench I

Trench, Tunnel or Drill Hole	Township, Range	Section/Subdivision	Year	Reference
trench	T. 1 N., R. 46 E.	NE¼ Section 19	1940	USGS Bull. 944-A, trench H
trench	T. 1 N., R. 46 E.	NE¼ Section 35	1940	USGS Bull. 944-A, trench K
trench	T. 8 S., R. 46 E.	SE¼ Section 31	1949	USGS Circular 304, Lot #1303

1970-1985

Trench, Prospect or Drill Hole	Township, Range	Section/Subdivision	Year	Reference
trenches (2)	T. 16 N., R. 27 E.	SE¼SW¼ Section 24	1976	CP-71, USGS OFR 79-1283; USGS OFR 86-427
trench	T. 16 N., R. 27 E.	SE¼NW¼ Section 36	1973?	USGS OFR 76-577, p. 29
trench	T. 16 N., R. 27 E.	Center Section 36	1976	CP-72, USGS OFR 79-1283
trench	T. 6 S., R. 43 E.	SE¼SE¼ Section 30	1978	CP-73, USGS OFR 83-245
trench	T. 9 S., R. 45 E.	NW¼NE¼ Section 10	1982	CP-75, USGS OFR 85-730
trench	T. 9 S., R. 45 E.	SW¼SE¼ Section 15	1984	IP-1, IGS Tech. Rpt. 90-7

The passage of the Mineral Leasing Act of February 25, 1920 (41 Stat. 437) brought the curtain down on the acquisition of phosphate through the Mining Law and rendered moot the need for the phosphate withdrawal and classification actions. Phosphate (and selected other minerals) could now be acquired only through a leasing system controlled by the Secretary of the Interior.

The last government sponsored investigation for phosphate classifications began in the 1960's and continued into the 1980's. Under this program, Known Phosphate Leasing Areas (KPLA) were defined. KPLA's are areas where the phosphate resource is available only through the competitive leasing provisions of the Mineral Leasing Act. Along with these new definitions, some field work supported further classification and restoration of withdrawn phosphate lands. The latter efforts were made in part to clean up the land records. Table 1, part 1970-1985, lists the location of those trenches and drill holes. As of the writing of this report, overall, by 2000 there have been four restoration actions on the temporary (secretarial) withdrawn lands, and 13 restoration actions on the Pickett Act withdrawal lands in Idaho.