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The Origin and Development of the Rectangular Survey System

Colorado falls into two main surveys. The 6th Principal Meridian Survey and the New Mexico Principal Survey. All the very best surveyors got high enough scores on the government testing in 1785 to get the flat land with few Indian problems. The lower scores were sent out here to measure our land. The workers were sunburned, hungry, lonely and often threatened or killed by the native Americans. This may give you pause to think about our pending quiz on the rectangular survey system. Your quiz score will not hinge on as many dates and names related to the history as it will on a true understanding of the rectangular grid system for measuring the size and location of land. You will have to draw and label each of the test parcels as outlined in the quiz as well as answer multiple choice questions about the development of the system.

The concept of townships and ranges had to have a starting place or a "point of beginning." In 1785, the new Geographer of the United States placed a stake in the ground on the north side of the Ohio River near the western boundary of the state of Pennsylvania. It is from this "initial point" that he and his survey crew ventured due west into the wilderness, marking the corners for the first government township in the country. From this initial point, the United States implemented a new method of subdividing property that affects more than 2 million square miles of land in 31 states and has been adopted by several other countries. The establishment of the Rectangular Survey System and its use as a standard for the rest of the country forms the basis of this article.

All land within the boundaries of the 13 American Colonies, after the ratification of the United States Constitution, came under the control and jurisdiction of the particular state in which the land was situated. Therefore, there was no federal government or so-called public land within that area.

These original lands, together with the states of Kentucky, Tennessee, parts of Ohio, Maine and Vermont, were all described by the then-accepted system of "metes and bounds"—that is, the measurement of land within certain external boundaries or lines limiting the tract on all sides. This system requires a commencement point easily distinguished—usually consisting of some prominent existing object, such as a large rock or stone, a particular type or size of tree, a certain point on a river bank, or anything that would seem to be of more or less a permanent nature. Each tract of land under this system is usually different in size, is described independently of any other tract, except perhaps by reference, and is not connected in any way with any base or starting lines.

As lands were acquired and incorporated within the new country, it became necessary to adopt a more uniform system than "metes and bounds" to survey these new governmental lands. Surveys were necessary to determine tracts for sale to individual citizens or as allotments for specific purposes, and to provide "homestead lands" for settlement by the public.

After some experimenting with the so-called "township system," which is based on a 6-mile square area, and after further study and trial, the system *"rectangular survey"* was devised in 1784 at the suggestion of Thomas Jefferson. The rectangular survey consists of adjoining contiguous tracts six miles square. Each tract, or township, contains 36 sections. Each "section" is one mile square and is numbered 1 to 36 commencing at the Northeast (NE)

Corner and running west to Section 6 then dropping down to 7 and east to 12, and so on to Section 36 in the Southeast Corner of the tract.

Descriptions utilizing monuments also may include, at least partially, a metes and bounds description. A monument may be defined as *a landmark that is used for the purpose of indicating a boundary of a parcel of land.* It may be either natural or artificial.

Natural monuments are rivers, lakes, streams, trees, mountains, rocks or springs.

Artificial monuments are landmarks such as fences, walls, houses, streets, alleys, posts, canals or drainage ditches.

A monument may consist of an "imaginary line" caused by a produced street or alley or the intersection point of two produced streets, etc.

This is the most dangerous of all descriptions — the danger becoming apparent in later years when it is found that the monument marker has changed or disappeared completely. Over a period of years rivers change course; lake, stream and even mountain boundaries change; trees may be cut or blown down; fences, walls, houses, posts and stakes are easily moved; canals and drainage ditches may be filled in; streets may be closed, be widened or have their names changed.

In 1784 the Continental Congress of the early United States faced many problems. The Revolutionary War with Great Britain was officially over, and the veterans were demanding their land bounties, or properties, that had been promised to them for their war service. Squatters were moving westward over the Appalachian Mountains or down the Ohio River into the wilderness to take possession of "free" land. The biggest problem facing the federal government was that it needed to generate revenues to pay off its war debts. Congress therefore developed a plan to use the vast lands from north and west of the Ohio River as a way to solve several problems at one time.

The first Congressional Committee of Public Lands, with Thomas Jefferson of Virginia as the chairman, put together a plan to artificially divide the government-owned lands between the Ohio and Mississippi Rivers into 16 separate districts that could eventually become independent states. These new lands would be either deeded to the war veterans or sold to raise money to pay off government obligations. The committee proposed that these western districts "…shall be divided into hundreds of 10 geographical miles square (a geographical mile is also known as a nautical mile, which is the distance measured at the equator of one second of arc), each mile containing 6,086 feet, and 4/10th of a foot, by lines to be run and marked due north and south, and others crossing these at right angles." The 1784 proposal also stated "these hundreds shall be subdivided into lots of one mile square each, or 850 acres and 4/10th of an acre, by marked lines." So the Ordinance of 1784 that was adopted by the Continental Congress, called for the creation of "hundreds" (now "townships") of 100 square miles and used the geographic mile measurement of 6,086.4 feet. Each of the one mile squares were called "lots" not sections as we use today. Conflicting claims to the lands that were proposed for division and subsequent sale prevented the Ordinance of 1784 from ever taking effect.

By the summer of 1784, Thomas Jefferson had been named a Minister to France and had left the country. In his absence, William Grayson of Virginia was named the new chairman. The committee continued to rework the 1784 plan and by April 1785 they had amended the ordinance to read: "…to divide said territory into townships of seven miles square, by lines running due north and south, and others crossing these at right angles … The plats

of the districts respectfully shall be subdivided (as the case shall require) into sections of one square mile, or 640 acres in the same direction as the external lines and numbered from 1 to 49."

Land Titles Before 1784

As the 13 original colonies of the United States grew and flourished, individuals pushed farther westward into the wilderness, settling where the resources of water, timber or good farmland existed. In colonial times the common method of subdividing and describing land used the "metes and bounds" system. Known landmarks such as rivers, rocks, trees and roads established the property boundaries and served as physical markers. Survey methods were crude at best and lacked a common reference grid that would successfully join together the odd shaped parcels. This resulted in some property boundaries overlapping while other areas consisted of gaps and gores of unknown ownership. Most of the members of Congress in the 1780s would have been property owners and keenly aware of the shortfalls in the metes and bounds system.

The proposed square mile survey system was not something that Thomas Jefferson and his Congressional Committee in 1784 just dreamed up. The plan was based on a culmination of methods that already existed in various parts of New England. Some examples of these existing methods include:

• In 1732, a pamphlet was published that called for the unimproved lands in Europe and the American colonies divided into "counties of about 33 square miles" with a county town near the center.

• In 1736, seven townships of six miles square had been laid out in Maine and Massachusetts.

• In 1760, the governor of what is now Vermont mapped out a plan to divide the Connecticut River valley into square townships with six mile sides.

• In 1764, a plan for creating frontier settlement communities was proposed where 100 families would share a square mile parcel of 640 acres.

• In 1783, a letter from General Rufus Putnam of Massachusetts to George Washington requested that lands be divided into six mile square blocks that could be given to his officers.

So the Ordinance of 1784, which is often called the "Jefferson Plan," was not the dream of one man. It was based on many years of trial and error.

The Land Ordinance of 1785

In May of 1785, the Grayson Committee again revisited the 1784 Ordinance making additional changes and modifications. On May 20, 1785, the Continental Congress of the United States adopted the revised plan, calling it "An Ordinance for ascertaining the mode of disposing of lands in the western territory." Today the plan goes

by the common name of the "Land Ordinance of 1785." The goal of this landmark legislation was to create a framework for subdividing a small

portion of federally owned or "Public Domain" lands in Eastern Ohio, however, the basic format of the Ordinance eventually stretched across the plains and mountains of the west to the Pacific Ocean and beyond.

The Land Ordinance of 1785 is a special document in that it required the following:

• Mandated a surveyor be selected to represent each of the 13 states;

• created an initial starting point for the first survey;

• divided lands into 36 "lots" of one square mile each;

• clustered these lots into townships that were six miles square;

• proposed a numbering system for lots within townships;

• required that all township boundaries be tied to compass lines running north and south and with other lines crossing at right angles of east and west;

• allowed the war department to set aside lands for the Continental Army as compensation for their war service;

• mandated that the treasury department was to sell either entire townships or square mile lots at public auction at a minimum of $1 per acre;

• reserved Lot 16 for public schools and Lots 8, 11, 26, 29 for future federal purposes; and

• reserved to the government "1/3rd of the gold, lead, silver and copper mines."

The Ordinance of 1785 created a scientific method of surveying and subdividing land, which, should have resulted in cleaner boundaries between adjoining property owners. While not specifically required by the Ordinance, it started the system for surveying all Public Domain lands before they could be legally sold and settled. The Ordinance used a rectangular format that was based on the geographic mile of 5,280 feet. But the unique feature of the system is that it attempted to use the north-south longitude lines and the corresponding east-west lines of latitude as a fixed grid to work from.

In the Ordinance of 1785, the Continental Congress called for the establishment of "seven ranges of townships" using the intersection of the Ohio River and the western line of the state of Pennsylvania as its "initial point" or "point of beginning." On September 30, 1785, Thomas Hutchins, the recently appointed Geographer of the United States and his crew of government surveyors started on the north bank of the Ohio River and headed due west into the forest. It is from this initial point that the government surveyors laid out range one. The survey of the "seven ranges" eventually took more than two years to complete.

The initial point for the seven ranges has been marked by the "Point of Beginning Monument" located on the north side of the Ohio River on the Pennsylvania - Ohio state line. There is no physical evidence of the exact spot where Thomas Hutchins started his survey, however the monument can be found about two miles east of East Liverpool, Ohio, near the approximate location. The seven ranges stretched 42 miles west of the Ohio River (6 miles x 7 ranges = 42 miles) and run south to Marietta, Ohio. The seven ranges survey eventually covered 1,641,724 acres of land.

The sale of federal lands within the original seven ranges survey took place in September and October of 1786 in New York City. The government had advertised the availability of 27 separate townships or fractional townships at the auction. A buyer could purchase an entire township or a square mile lot. No mention is made of the term "section" to designate a square mile parcel. A successful bidder would have been required to pay one third of the sale price on the day of the auction and the balance within three months.

The deed from the government also reserved "1/3rd of the gold, lead, silver and copper mines" on the acquired lands.

Thirty-two successful bidders acquired the rights to 108,431 acres of lands generating the potential for $176,090.07 to the U.S. Treasury. None of the entire townships were sold at the auction. The highest bid was on a one and one-half acre fractional lot directly on the Ohio River across from what is now Wheeling, West Virginia. That parcel went for $22 per acre. Most of the parcels were sold for the minimum bid of $1 per acre. Many successful bidders failed to make their balance payment within the three months that were allowed. In the end the government only made $87,325 from the auction.

The first patent or deed from the United States was issued on March 4, 1788, to John Martin.

Martin had acquired the 640 acres designated as Lot 20, Range 4, Township 7. This square mile section is presently located in Belmont County, Ohio.

The sale of land within the seven ranges was a big disappointment for the government. Critics called for an overhaul of the survey and land auction system. Congress did agree to sell off large blocks of acreage in the western territory to private land companies who in turn would resell smaller parcels to settlers. One of these businesses acquired

a Patent from the United States Government in 1792 for more than one million acres lying west of the seven ranges survey. As part of the sale, the government stipulated that the purchasers survey the land using a continuation of the township and ranges lines used in the seven ranges survey.

The Defects of Ordinance of 1785

The Ordinance of 1785 did have its faults. One glaring error was that it failed to take into consideration the convergence of the north - south meridian lines as township boundaries moved farther north. This convergence is caused by the curvature of the earth and clearly needed to be addressed.

A second major problem was created when the government surveyors were only required to survey and mark the 36 square mile township boundaries and not the individual lots or sections. It was up to the individuals who purchased a parcel of land to hire a local surveyor to identify the exact boundaries of their property.

Congress began to address these and other problems as early as 1796. By 1800, the government had enacted a revised land act that corrected these and several other shortfalls. The revised act reduced the minimum size to be sold at an auction from 640 acres to 320 acres and allowed successful land purchasers to be able to repay their obligations over a five-year period.

In the decades that followed, major parts of the Ordinance of 1785 had to be rewritten or clarified, however the basic framework of 36 square mile townships using principal north-south meridians and corresponding east-west baselines never changed.

37 Initial Points Covers the United States

The United States government

continued to add lands to the public domain by treaties, by war and by outright purchases. As the country grew, additional lands were prepared for sale.

The United States government tried to stay ahead of the miners, farmers and merchants as they worked their way west. The government used a leap frog method of starting new surveys in areas where the settlement pressure was greatest. In every case a point of beginning had to be established that would serve as a reference for a new survey. Natural features or landmarks were often used as a starting point for a new survey.

The seven ranges survey used the western edge of the state of Pennsylvania as it's north - south meridian line. The government created a second meridian line in 1798 at the confluence of the Great Miami and the Ohio Rivers and went due north. They later called this line the "first meridian" and it eventually became the western boundary for the state of Ohio. A perpendicular baseline was established allowing townships and sections to be laid out from this initial point. It was from this second point of beginning in Van Wert County, Ohio, that they surveyed most of Northwest Ohio.

This rectangular survey system, now in general use in this country, was officially adopted by the government in 1805. It was first used in the area known as the "Northwest Territories," lying west of Pennsylvania, north of the Ohio and east of the Mississippi rivers. It also covers practically all of the land west of the Mississippi—the sole large exception being the state of Texas. However, some railroad grants in that state have been re-surveyed into sections on the "rectangular survey" basis. All original surveys of the lands in these expanded areas have been made by the U.S. government under the jurisdiction of the General Land Office.

They repeated this pattern in southeast Mississippi in 1803 (Washington Meridian) and in southern Alabama (St. Stephens Meridian) in 1805 when new meridian lines were drawn perpendicular to the then existing boundary between the United States and Spain on the 31st parallel. Townships and sections were laid out using the same

6-mile by 6-mile grids. The initial point for the St. Stephen survey, also called the Ellicott Stone, is found approximately 20 miles north of Mobile, Alabama.

The second principal meridian and associated baseline was established in 1804, and the surveying from that point covers most of the state of Indiana and parts of the state of Illinois. This initial point can be found at a small park near the actual site and is highlighted with a monument on the lawn of the Orange County Courthouse in Paoli, Indiana.

As the country grew, so did the need for additional land. Initial points were established and surveys started covering most of what is now the state of Illinois in 1805, the state of Louisiana in 1806 and Michigan in 1815. It was also in 1815 that the fifth principal meridian was established at the confluence of the Arkansas and Mississippi Rivers and surveyed north. The corresponding baseline was established at the confluence of the St. Francis and Mississippi Rivers and surveyed west. The two lines met and created an initial point near the present town of Blakton, Arkansas. It is from this point that much of the land that was acquired from France in the Louisiana Purchase (1803) is surveyed. Elkhorn Township in Divide County, North Dakota

(T 164 N - R 103 W) is in the extreme northwest corner of the state. This township was surveyed from the fifth meridian initial point located in Southeast Missouri. You will find this initial point in the Louisiana Purchase Monument State Park in eastern Arkansas.

The placing of initial points and the subsequent surveys did not always precede development. California had formally severed ties with Mexico in 1848 and became a state in 1850. The first of the three initial points for the state of California was set in 1851 on the top of Mt. Diablo, about 25 miles east of San Francisco. The corresponding survey covers most of northern and central California and the entire state of Nevada. A second principal meridian and baseline was established from an initial point near the crest of San Bernardino Mountain east of Redlands, California. This survey covers all of Southern California. The third survey is called the Humboldt Meridian and covers a small area in the northwest corner of the state.

Not all of the initial points are located in isolated parts of the country. The Tallahassee Meridian survey (1824), which covers the state of Florida and a small portion of Southern Alabama, is located

three blocks southeast of the

Florida State Capitol Building

in downtown Tallahassee. The Willamette Meridian survey (1851) which covers the states of Oregon and Washington is in the Willamette Stone State Park just west of Portland, Oregon. The initial point for the Salt Lake Meridian (1855) is located in the southeast corner of Temple Block in downtown Salt Lake City, Utah. The Salt Lake Meridian survey covers most of the state of Utah.

The initial point for a majority of the state of Oklahoma was located close to the old Fort Arbuckle, seven miles west of Davis, Oklahoma. Called the Indian Base and Meridian (1870), it is one of the few initial points where an original stone marker is still present. The panhandle area of western Oklahoma is covered by the Cimarron Meridian and Baseline survey (1881). Its initial point is near the southwest corner of the Oklahoma panhandle close to the Texas and New Mexico border.

The state of Texas does not use the Rectangular Survey System. For a complete history of land surveys in Texas you should review an article that appeared in the July/August 1997 issue of Landman magazine on the origins of land titles in the state of Texas.

Five different initial points are being used to survey the state of Alaska. The first was the Copper River Meridian (1905) followed by Fairbanks (1910), Seward (1911), Kateel River (1956) and Umiat (1956). The North Slope along the Arctic Ocean is covered by the Umiat Meridian. There are still thousands of square miles in Alaska that remain unsurveyed.

Conclusion

The Rectangular Survey System has served the United States well. From rather humble beginnings in the eastern Ohio territory, the system was eventually used in every state in the country except for the original 13

states plus Vermont, Maine, Kentucky, Tennessee, Texas and Hawaii.

The effects on this country go well beyond its ability to identify or locate

a particular piece of property. The grid-like pattern of north-south and east-west lines can be linked to many county roads and main streets throughout the country. Immigrants with common beliefs and religions often settled in a common township creating small communities.

In many townships section sixteen, the school section, later became the center of local business and government.

Who is responsible for a plan that has touched such a large part of the country? The early farmers, merchants and land speculators who lived in the New England and Mid-Atlantic colonies had tried and tested a variety of land division methods. Over time, these property owners had slowly begun to adopt a system that used the north-south and east-west compass lines to form a repeating pattern of squared off parcels. However, it took the bold vision and leadership of Thomas Jefferson, William Grayson and the Continental Congress to take this simple idea and integrate it into their much bigger plan for building a nation out of the western territories.

With a little bit of practice, the townships, ranges and sections found in a standard plat book can make the Rectangular Survey System easy to understand. The basic format of the system worked well in 1785, and it continues to serve the country today.

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