Chapter 3
ACTIVITY DESCRIPTION

3.1 History

Although gold had been discovered in California as early as 1775, California's famous Gold Rush began with the discovery of gold at Sutter's Mill on January 24, 1848. At first, individual dredgers could "strike it rich" by panning, and using simple equipment such as rocker boxes and sluices. However, by the mid-1850's, the easily recoverable gold had been mined out and gold mining began to be dominated by well capitalized companies (California Divisions of Mines and Geology, 1970).

Hydraulic mining emerged in several locations simultaneously in the early 1850's. After extensive water conveyance systems were completed, it became an important segment of the gold mining industry and thrived from about 1860 to 1884 when the Sawyer Decision (which addressed environmental and commerce damage caused by hydraulic mining debris) led to the decline of hydraulic mining in California.

Underground "hardrock" gold became a major gold producing industry as milling technology improved after hydraulic mining began to wane. However, hardrock mining for gold was suspended during World War Two and never fully recovered after the war.

In the late 1890's, large, mechanical dredges (e.g., bucket and dragline dredges) were developed to mine low grade gold deposits in rivers or on their outwash fans. These dredges floated in rivers or in their own ponds and mined ahead by scooping up gold-bearing gravel in huge steel buckets, extracting the gold, and dumping the waste cobbles into great mounds behind them. The gold dredging industry grew steadily and reached its peak during the Great Depression. However, because of low gold prices and increased operating expenses, the business declined. By the 1950's very few large gold operations remained.

In the early 1960's, a new inexpensive and portable dredge emerged – the suction dredge. Self Contained Underwater Breathing Apparatus (SCUBA) and Hookah Air systems allowed individuals to use suction dredges underwater like vacuum cleaners to excavate sediment from a river or stream. Anecdotal reports hold that the individuals first using these new machines in northern rivers recovered impressive amounts of gold. Although suction dredges began as self-crafted devices, a number of manufacturers produce suction dredges of various sizes and prices, including companies such as Keene and Proline.

3.2 Number of Suction Dredgers

The number of general suction dredge permits issued annually by CDFG increased dramatically from 3,981 in 1976 to a peak of 12,763 in 1980, echoing the steep rise in gold prices in the late 1970s. On average, CDFG issued approximately 3,200 suction dredge mining permits to California residents annually for the 15 years prior to the current moratorium established in July 2009. The comparable average number of non-resident suction dredge mining permits issued annually by CDFG was approximately 450 (Figure 3-1).

3.3 Equipment

3.3.1 General

Although suction dredges vary in size and power, their basic configuration is comprised of a floating gold recovery system (known as a sluice box) attached to a suction hose (see Figure 3-2). These machines are operated by one or two individuals who control the hose underwater using a supplied air system as necessary.

Suction dredges are generally driven by either a gasoline or diesel engine that runs a centrifugal pump. The pump draws in river water and forces it through a series of hoses and tubes to create a Venturi effect, or a strong suction. Sediment from a river or stream is drawn up the suction hose and discharged into one or more sluice boxes. Material which is not trapped by the sluice filters passes back into the waterway. The heavier, gravel-like materials are deposited just off the tail (end) of the sluice back into the stream while finer sediments (clay and silt sized particles) are carried downstream by the water current (USFS, 2010). In general, dredge performance or capacity (reported as cubic yards per hour by manufacturers) is primarily a function of the diameter of the intake nozzle and the size and characteristics of the substrate, as well as engine horsepower (HP). Further description of the range in dredge performance is provided below in Section 3.3.3.

Sluice boxes are usually metal boxes equipped with steel riffles and are used to recover gold and other high density solids (e.g., black sand, lead weights and shot, mercury amalgam, mercury) from bulk sediment. Gold-bearing sediment is washed through a sluice box and gold and other high density solids settle behind the riffles. Materials discharged from the sluice (e.g., low density sediment, small gold particles, etc.) are called tailings. Gold and other dense solids are collected when the sluice is cleaned. Sluice boxes have become increasingly complex as manufacturers attempt to increase their gold-trapping efficiency (e.g., systems employing several sluice boxes, sediment classifiers, and jet flare technology). However, because manufacturers do not provide test data for different designs, it is not possible to state how much better or worse different designs fare at trapping gold.

Almost all dredges are supported in the water by floats made of plastic, foam, or tire tubes. Some dredges are designed with twin pressure systems—they have two engines, two pumps, and two pressure hoses which attach to a special jet. The main advantage of this type of system is that it allows a dredge operator to move material faster by combining portability with capacity.

Larger dredges—those with a nozzle size larger than 6 inches—generally require at least two operators. In addition, the larger dredge systems are almost always equipped with Hookah air compressors, which can supply air to one or more divers.

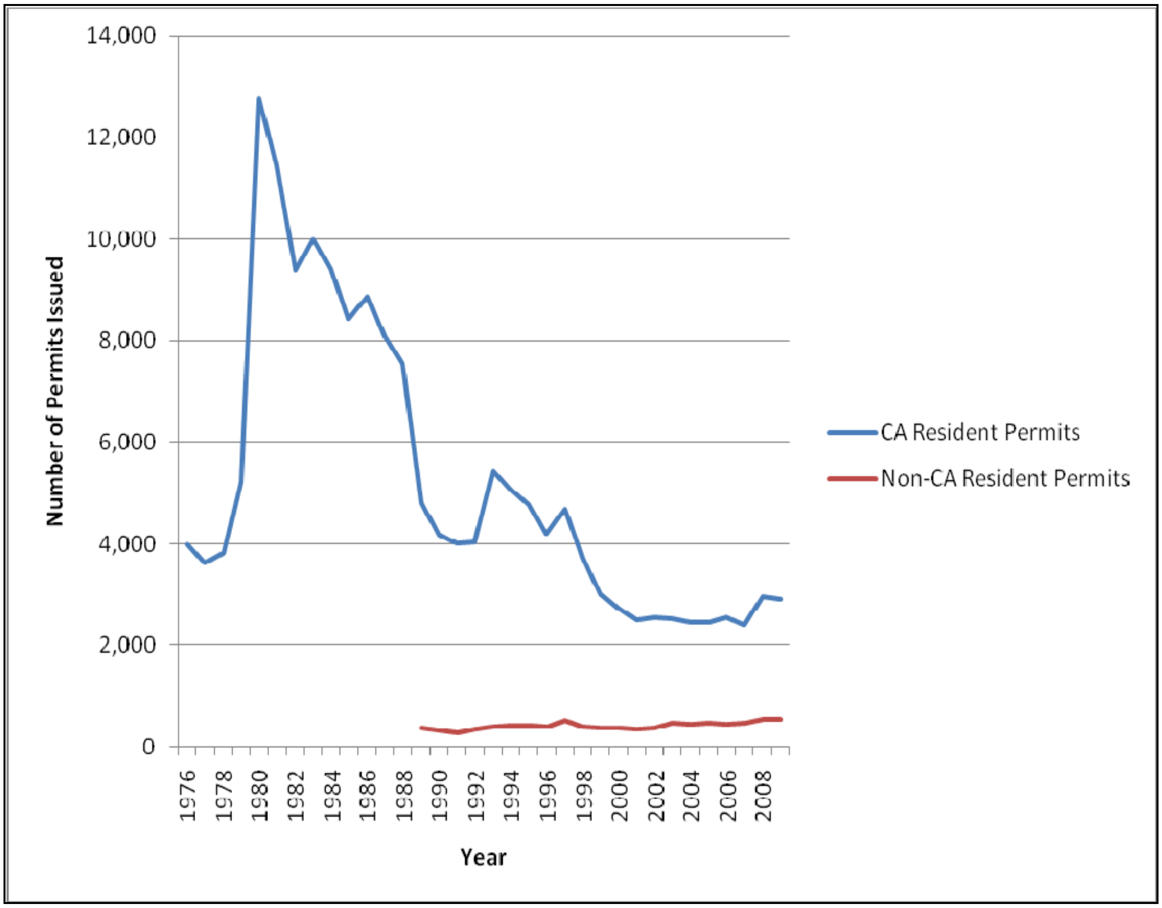


FIGURE 3-1. HISTORICAL TRENDS IN SUCTION DREDGE PERMIT ISSUANCE BETWEEN 1976 AND 2009

Source: California Department of Fish and Game Historical Licensing Statistics – Special Licenses and Permits

3.3.2 Types of Dredges

<u>Surface Dredge</u>

Surface dredges are dredges that have their engines and sluice boxes mounted above the water's surface (see Figure 3-2). It is by far the most common type of suction dredge. They are most effective in shallow water and thus, are easily operated without diving equipment. Surface dredges range in size from small backpack models to large models up to ten meters in length.

<u>Subsurface Dredge</u>

Subsurface dredges differ from surface dredges in that their gold recovery systems are suspended underwater beneath the dredge's floats. Since the sluice box can be raised or lowered, it can be maintained close to the stream bottom. Therefore, the sand and gravel need not be pumped all the way to the water's surface. This minimizes the amount of power required to operate the dredge and decreases the overall weight of the device. For example, a 5-inch subsurface pump can use the same pump from a 3-inch surface dredge yet move 2-3 times more material than the surface unit (Herschbach, 1999). However, the recovery rate of gold for the subsurface dredge is less effective. The recovery system utilizes a long, enclosed chamber with removable riffle trays that are attached along the bottom. And since the riffle trays are relatively small and provide less surface area in which gold may be trapped, it is less efficient at fine gold recovery than the surface dredge. Despite lower recovery rates, the benefit of decreased weight makes these types of dredges popular with suction dredgers who favor portability.

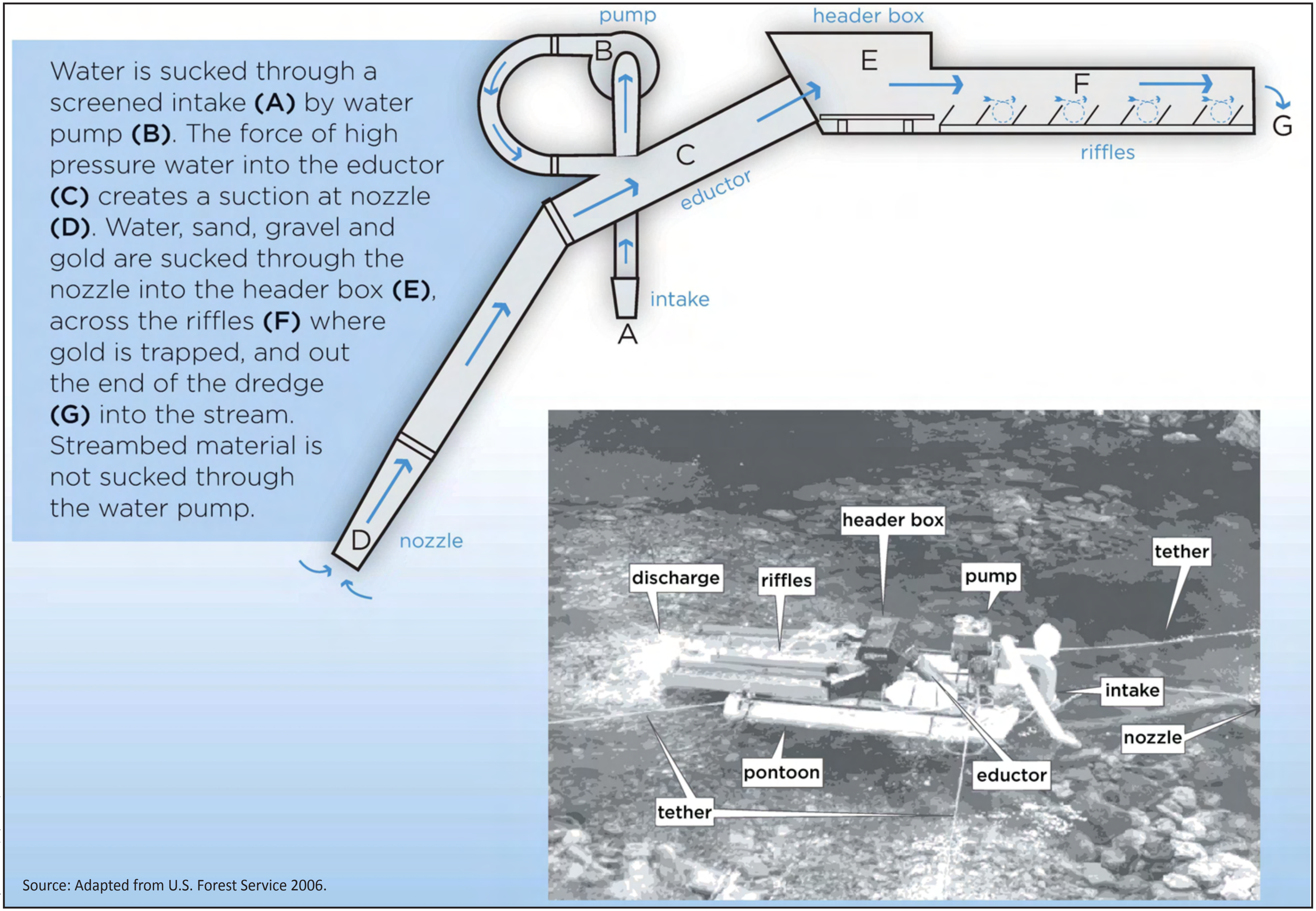
Underwater Dredge

Underwater dredges employ an enclosed gold recovery system that rests on the river or stream bottom underneath the float-supported engine(s). Like the subsurface dredge, the underwater dredge is an enclosed chamber with riffle trays that are suspended under water. However, unlike the subsurface systems, there are no chains attaching the underwater sluice to the floats. Instead, the sluice box rests on the bottom, supported in an upright position by the diver; the pressure hose is its only link with the water surface. The underwater dredge has no suction hose; the intake nozzle and jet are built as one recovery system, generally a metal or plastic tube with an attached metal elbow. Instead of manipulating just a flexible suction hose, as with the subsurface dredge, a diver using an underwater dredge must maneuver the whole unit around the bottom, keeping it always in an upright position and completely submerged. If it falls over, any gold in the small riffle tray may be lost. The reported main advantage of underwater dredges is portability. The components of an underwater dredge, for instance, are approximately half the weight of a subsurface dredge, and they are more compact and easier to carry. As a result, these underwater dredges are primarily used for reconnaissance of sites; when a gold streak is found a more efficient dredge type is employed.

3.3.3 Size of Dredges

Dredge size varies greatly according to dredge type, make, and model. Table 3-1 summarizes characteristics of common dredge types and sizes. In general, suction dredges equipped with nozzle sizes 6 inches and smaller are considered to be recreational, while larger nozzle sizes are employed for more commercial endeavors. Respondents to the Suction Dredger Survey (Appendix F) reported using nozzle sizes between 2 and 8 inches in diameter. This SEIR considers the effects of nozzles ranging from 2 to 10 inches in diameter.

The volume of sediment moved based on varying nozzle size is presented in Table 3-2 and Figure 3-3. In general, dredges equipped with small-diameter nozzles have less sediment excavating capacity compared to those with larger diameter nozzles. Although scientific data is lacking, experienced suction dredgers have noted that excavating capacity is more directly limited by the nozzle diameter rather than engine HP size (McCracken, 2005). Doubling the engine power beyond what is most commonly used for a given nozzle diameter would not necessarily double the sediment excavating capacity. For instance, on a 3 inch diameter nozzle, using a 10 HP engine rather than a standard 4 HP engine would not significantly increase the dredge capacity, as the unit remains constrained by the volume and size of sediment that can be passed through the nozzle. In addition, technological advances have lead to improvements on engine efficiencies such that older engines, though labeled with a similar HP rating, may be less efficient than newer ones.



Source: Adapted from U.S. Forest Service 2006.

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Figure 3-2
Typical Small-Scale Suction Dredge

Based on the survey results, the median nozzle size used by dredgers is 4 inches, and the median engine power is 5.5 HP and 6.5 HP for California resident and non-resident permit holders, respectively.

It is important to note that presently, only very limited data sources are available which detail suction dredge capacity, and the reported production rates exhibit a great degree of variability. During the Initial Study, data from Keene Engineering's 2008 product catalogue were used to illustrate the dredging capacity for the Program. However, several sources have indicated that the manufacturer's specifications for production rate were not realistic because they represented the maximum volume of substrate that the dredge can processes under ideal conditions. It is unlikely that these production rates are achieved under actual circumstances.

Generally speaking, the sediment movement power of suction dredges can vary greatly depending on a number of factors including size of the substrate, bed compactness, water depth, water velocity, visibility, and user experience. Typical situations which slow production rates include dredging in areas with abundant cobbles or boulders larger than the nozzle size (which require significant time to physically move), dredging in crevices or joints, and in shallow or fast moving water (USFS, 2010). Given the magnitude of these influences on dredging volumes, the USFS estimates that actual production capacities are 50-90% less than the maximum capacity cited by manufacturers (USFS, 2010).

During public review of the Initial Study, several individuals submitted personal accounts of their own production rates, generally calculated using dredge hole volume and time spent dredging. Similar information was also submitted as part of the suction dredge survey. While of interest, these production rates are not incorporated into this document due to their specificity towards a single nozzle size and the inherent difficulty of verifying their calculation methodology. However, Keene Engineering provided a secondary data set which provides detailed information documenting a range of equipment sizes under two different substrate environments in California Rivers. These more conservative production rates are illustrated in Table 3-2 along with the original manufacturer specifications to provide a broad overview of the expected range for dredging volumes based on nozzle size.

3.4 Suction Dredging Activities

This section briefly describes the basic steps involved in suction dredge mining activities. Information was derived from the Suction Dredger Survey conducted as part of this SEIR (Appendix F), the Modern Gold Dredging booklet (Heavy Metal Mining Company, 1992), website advice from miner Dave McCracken (2008), the New 49ers Club Rules (Koons, 2004), USFS technical memo on suction dredging (2010), and dredge manufacturer Keene Engineering, Inc. (2008b). The information provided by these sources appears to be based on personal experience and has not been verified or described in peer reviewed, scientific publications. These references were instructive in providing an intimate and knowledgeable perspective on suction dredging, but they are not necessarily definitive or complete. Further, CDFG was unable to validate this information in the field due to the legislative moratorium.

TABLE 3-1. CHARACTERISTICS OF VARIOUS SUCTION DREDGES

Dredge Size & Type	Nozzle Size (inches)	Engine Size (horsepower)	Dredge Pros	Dredge Cons
Backpack dredge	2-2.5	2.5-3	Light and easy to pack in and out of the location. Good for prospecting and sampling. With suction nozzle it can be used in very shallow water.	Small capacity, very low production capability.
Sampling dredge	3	4	Still lighter and smaller than a 4-inch and can move much more material than the 2 inch. High portability. This sized unit is fairly good for use in remote places	Low production rate.
Sampling/small scale production dredge	4	6	The smallest of the production dredges but still good at sampling for pay streaks. Still fairly mobile, and good for semi-remote sites.	Heavier and more work to put together and take apart.
Larger scale sampling/production dredge	5	9	Good for larger operations. Still good for sampling, but on a larger scale. Hose is flexible and can be operated by a single dredger.	Heavier to disassemble and move around than smaller dredges. May have multiple or larger engines.
Recreational or smaller commercial production dredge	6	14	A useful size dredge for someone who has found a sizable pay stream and wants maximize production. Useful in larger rivers to locate gold in bigger areas. Can move rocks and gravel, and sand up to about 5 inches in diameter without plug-up of the hose or jet.	Heavier Unit. Larger nozzle makes it harder to sample with. The larger hose isn't as flexible as a smaller one. Although one person can operate it, two person teams are better. Rocks are uncovered so quickly by this size unit that a single operator can be overwhelmed with the work of clearing large cobbles and small

Dredge Size & Type	Nozzle Size (inches)	Engine Size (horsepower)	Dredge Pros	Dredge Cons
				boulders that don't fit in the suction nozzle.
Commercial dredge	8	46	Good size for commercial operations.	Heavy Unit. Manning the hose and moving the rocks require at least two persons to make productive use. Dredges this size are legally limited in which waters they can be used.
Larger commercial dredge	10	95	Good for larger commercial operations.	Heavy unit. Needs a team of underwater workers to operate. Not legal under previous or proposed regulations.

Source: Dorado Vista, Inc. N.D.; Keene 2009

TABLE 3-2. VOLUME OF SEDIMENT MOVED BASED ON NOZZLE SIZE

Dredge Nozzle Diameter (inches)	Manufacturer Specifications (maximum reported)		2009 Manufacturer Field Testing Results			
			Gravel Bars (Klamath River)		Rocky Substrate (Yuba River)	
	cy/hour	cy/day (6 hours*)	cy/hour	cy/day (6 hours*)	cy/hour	cy/day (6 hours*)
2	1.4	8.4	0.18	1.08	0.12	0.72
2.5	2.4	14.4	0.23	1.38	0.15	0.9
3	3	18	0.46	2.76	0.3	1.8
4	5.2	31.2	0.69	4.14	0.46	2.76
5	10.5	63	1.37	8.22	0.91	5.46
6	17	102	1.6	9.6	1.07	6.42
8	27.5	165	3.43	20.58	2.28	13.68
10	Not reported	Not reported	7.31	43.86	4.87	29.22

** 6 hours was selected based on the Suction Dredger Survey results (Appendix F), which resulted in an average between five and six hours. The average duration was rounded up to provide a conservative estimate.*

Source: Keene 2008a and 2009.

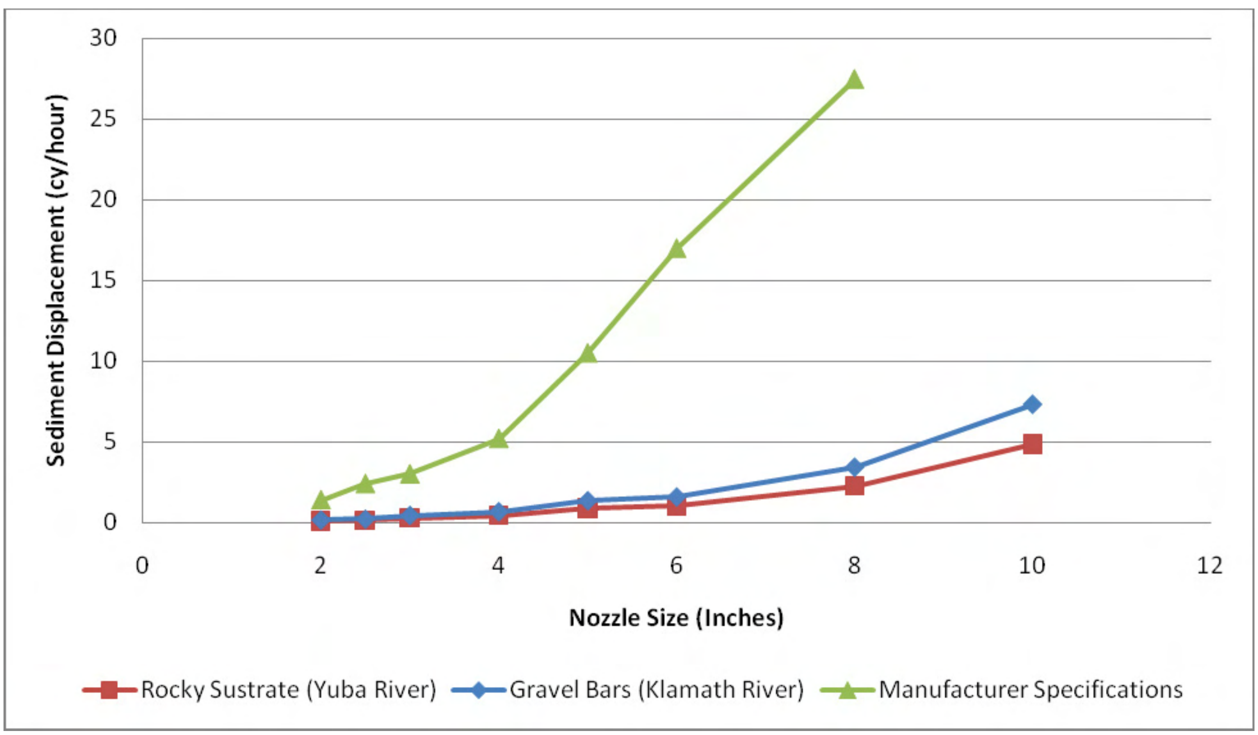

FIGURE 3-3. VOLUME OF SEDIMENT MOVED BASED ON NOZZLE SIZE AND SUBSTRATE TYPE

Source: Keene 2008a and 2009

3.4.1 Selecting a Site

In seeking a good site with potential for gold, suction dredge miners consider river processes and river form in prioritizing their locations, as well as past history with sites producing gold. In California, gold found in streams, floodplains, and terraces is generally alluvial, having been previously transported and deposited by streams. A placer deposit is the collection of valuable minerals (in this case gold) concentrated in a dense depositional site. In California, placer deposits are typically comprised of alluvial sand and gravel. While placer deposits are generally thought of as occurring in the active stream channels, placer gold deposits are often commonly held in the stored alluvium in the floodplains and relict terraces adjacent to stream courses. Within streams, placer gold deposits will generally be found in zones where sediments are deposited or are collected. Because the gold is typically very fine (less than .0015 inches in diameter) it will more likely deposit (or settle out) in slower water environments, such as in deeper pools or along point bars on the inside bend of river turns. Gold may also be found in the stillwater deposits downstream of obstructions, such as rocks, vegetation, logs, or bedrock outcrops. Backwater eddies along the stream banks or around coarse woody debris (CWD) may also help settle gold. As one of the denser materials transported by any stream, gold is among the first to drop out when a stream slows and energy diminishes. Unless the gold is re-initiated into transport, it often sifts down through coarser sediments (sand and gravel) ultimately settling on a hardpan layer or local bedrock. Deep narrow crevices and cracks, especially occurring in steeply dipping rocks whose strike or trend is perpendicular to the stream flow, are particularly favorable for the occurrence of gold. A series of parallel, deep, narrow cracks or crevices at right angles to streamflow are productive because they form natural riffles and pockets to trap gold.

Dredging is generally conducted in waters with 10 feet of depth or less. However, larger dredges equipped with Hookah Systems and hose lengths can allow for excavations in deeper waters (such as the Klamath, American, and Yuba rivers).

3.4.2 Accessing the Site

Suction dredge operators usually rely on personal transportation to access sites. These mining areas can be accessed via vehicle or boat depending on the location. According to the Suction Dredger Survey, one way travel distances for in-state dredgers averaged 132 miles while for out-of-state dredgers, this distance averaged 851 miles. Miners generally use existing trails and pathways for ease of travel, though such pathways and trails are not always available. Approximately 72% of California-resident permit holders reported that they typically drove off paved roads to access dredging sites, of which 87% indicated that they used a car or truck in doing so. Fewer non-Californian permit holders reported driving off of paved roads (68%); though of those who did, the majority used a car or truck. It should be noted that miners are required by law to obtain permission to enter private lands, as CDFG's proposed permit regulations do not authorize trespassing.

3.4.3 Delivering Equipment

Suction dredge mining equipment, including the dredge engine, pump oil, fuel, cables or ropes to hold the dredge in place, winches to move boulders, hand tools to loosen gravel and process materials, and other components, are usually driven into an area where the miner will stay. The equipment may require additional secondary transport if the mining location is remote and not accessible by roads from the campsite. If the ultimate site is inaccessible by vehicle, miners will generally carry the equipment, fuel, and supplies to the desired location and assemble the suction dredge on the bank. It is a standard practice to drain oil and fuel from motors during transportation or carrying. The amount of fuel brought for the rigs to the mining location is generally limited to the day's estimated needs.

Dredges are normally disassembled during transport over dry ground and reassembled on-site. Assembly time can range anywhere from 30 minutes to 1 hour depending on the dredge size and accessory equipment.

3.4.4 Securing Equipment

Any equipment not used during the dredging operation is generally secured at a campsite or along the banks of the area to be dredged.

During operation, dredges are usually secured in the waterway using rope or cable to prevent drift while the dredge is in use. This is generally done using ropes with two separate knots and a heavy or stationary object near the stream bank.

3.4.5 Conducting Dredging

Once the components have been assembled and placed at the mining site, the pump must be fully primed – full of water with all air removed – before starting the engine.

Dredging operations are generally divided into "sampling" and "production" phases. The first phase, "sampling," is the testing of areas to determine the presence or absence of gold laden areas, or "pay streaks." Pay streaks are referred to as such because of the notion that gold deposits settle out in areas with definite left and right boundaries and less definitive upstream and downstream margins. Sampling can involve several test holes and can be conducted with smaller suction dredges until a suitable production area is located. A dredge hole is the general term for the area in which the miner is dredging. These dredge holes are commonly cleared of large cobbles and rocks to allow the dredge to suck up smaller, gravel-sized sediments from the stream bed.

Experienced dredge miners recommend that one find the tail end of a streak and move upstream when in a production phase, so that the tailings fall in areas already worked. In order to fully take advantage of the suction dredger's production rate, the operator frees and moves over-sized rocks (too large to be sucked into the nozzle) from the stream bed work area. The basic movement for a suction hose is placement into the streambed at a slightly upstream angle, and then moving upstream. Cobbles are generally tossed downstream rather than to the side to prevent the need to re-excavate if the diver chooses to move laterally to locate a more promising area. Suction dredgers will often perform multiple passes over a streak, until they have reached the bottom of the gold deposit.

On occasion, to reach gold that has deposited below or around large boulders, winching or prying is performed. Crowbars, winches, or pull cables/chains are used to move the boulders out of place during dredging.

During dredging, a solids-to-water balance must be maintained to ensure suction. The solids content being dredged should generally never exceed 10%. Therefore, care is exercised to prevent dredging excess amounts of sand.

3.4.6 Refueling

Most engines will require refueling during the day, and can be replenished with the fuel that has been brought to the site. Dredgers often refuel their equipment where they are operating. Oil changes may also be required periodically.

3.4.7 Processing of Material

Clean-up consists of daily removal of coarse pieces of gold from the sluice using tweezers. Normal conditions require that the sluice box be washed out on a daily or weekly basis to remove accumulated materials. Generally, the sluice box does not need to be cleaned until gold is beginning to be deposited below the upper third of the box. When the sluice box is ready to be cleaned, the carpet underlay is removed and all materials captured in the box are washed into a large bucket or washtub. The contents of the washtub become known as concentrates. In addition to containing gold, concentrates can also contain mercury or other materials (e.g., lead fishing weights) that have settled to the bottom of the river alongside the gold deposits. The concentrates are filtered through a series of screens and/or panned to work the concentrates down to small batches containing gold, which then can be processed through a final dry process.

The final process is sometimes done at camp where there is a flat work surface and shelter from wind. Alternatively, miners will take the concentrates home or deliver them to a service for processing. This final procedure involves the drying of concentrates, filtering, and physical separation using magnets and small hand tools. In addition, chemical separation, by means of mercury and acids, may be used for the amalgamation process. Amalgamation is a method of separating finer gold particles from other materials. In this process, clean mercury is brought into contact with clean gold, and the gold becomes wetted and "drawn into" the mercury. This results in a solution of gold in mercury, or an alloy of gold and mercury called amalgam. After the mercury has gathered in the gold, it is removed by dissolving it in nitric acid or by driving it off as a vapor by heat, leaving the gold behind. While mercury should be treated as a hazardous waste, some miners collect and store it, while others may dispose of it by vaporizing it in a cooking pan on a camp stove. The spent nitric acid contains mercuric nitrate which is extremely toxic (Environmental Health and Safety, 2009). That said, 98% of both in-state and out-of-state suction dredgers reported that they did not use mercury and/or nitric acid to process concentrates.

Hydrochloric or sulfuric acid may also be used to clean stained gold but neither acid will dissolve mercury amalgamated with gold. Nitric, hydrochloric, or sulfuric acids present similar concerns as mercury regarding handling, storage, and disposal.

3.4.8 Location

Suction dredging can take place throughout California, though much of the suction dredging occurs on private lands or unpatented claims owned or leased by individuals and mining clubs. In some cases, individual club members pay a fee to use the club's claim, such as with the New 49ers (New 49ers, 2009). Clubs cannot prohibit the public from accessing unpatented claims for purposes other than mining. These clubs may provide facilities, infrastructure, supplies, and also have their own rules and guidelines for suction dredging and associated activities. Many miners also own their own unpatented claims to which they have an exclusive right only to the locatable minerals under claim. Table 3-3 below highlights the counties most frequented by suction dredgers in 2008, as reported in the Suction Dredger Survey:

TABLE 3-3. COUNTIES VISITED FOR SUCTION DREDGING IN 2008

California Resident Permit Holders	
Counties	**Frequency Mentioned**
Sierra	115
Plumas	112
Siskiyou	110
Placer	94
El Dorado	68
Trinity	65
Mariposa	64
Tuolumne	62
Nevada	55
Yuba	41
Butte	35
Los Angeles	34
Amador	29
Shasta	29
Calaveras	22
Madera	20
Kern	18
Stanislaus	16
Merced	10
Fresno	8
Humboldt	6
San Bernardino	5
Del Norte	4
Lassen	4
Sacramento	3
Sutter	2
Contra Costa	1
Modoc	1
San Benito	1
Solano	1
Tehama	1
Yolo	1
Total responses	***1,037****

Non-California Resident Permit Holders	
County Name	**Frequency Mentioned**
Siskiyou	172
Sierra	45
Plumas	43
Placer	20
Trinity	15
Tuolumne	14
Yuba	10
Calaveras	7
Humboldt	6
Nevada	6
El Dorado	5
Mariposa	5
Butte	4
Kern	4
Lassen	2
Los Angeles	2
Shasta	2
Stanislaus	2
Amador	1
Del Norte	1
Madera	1
Total responses	***367****

**=total may be greater than the number of surveys returned, as some respondents reported visiting multiple counties*

As shown, Sierra, Plumas, Siskiyou, and Placer counties were among the most visited areas for California resident permit holders, while dredgers residing out of state favored Siskiyou County. Figure 3-4 depicts the subwatersheds in California where dredging was reported to have occurred in 2008. As shown, most of the subwatersheds where dredging occured are located in the Sierra Nevada Range and in tributaries to the Klamath River. Figure 3-5 illustrates the estimated dredging intensities for California resident permit holders by river basin, based on an analysis of survey data. Figure 3-6 shows the same information for non-California resident permit holders. Figures 3-5 and 3-6 show that the highest estimated dredging intensity for both California resident permit holders and non-California resident permit holders occurs in the northern Sierra Nevada Range and in the Klamath basin and its tributaries.

3.4.9 Timing

Seasonality

Most suction dredging occurs in the summer, when flows are lower, water temperatures are higher, and water clarity is greatest. In addition to seasonal restrictions imposed by the permits, underwater visibility is a key aspect for suction dredge mining when excavating an existing dredge hole, and when working with more than one diver. Therefore, wet or rainy conditions are not favorable. (McCracken, 2008)

Duration

California-resident permit holders spent, on average, 30 days per year operating a suction dredge, whereas out-of-state permit holders averaged just over 33. Per day, the average number of hours spent dredging was reported to be 5.2 hours for California residents and 5.4 hours for non-California residents. A substantial portion of this time involves moving larger materials out of the path of the suction dredge, rather than dredging itself. The remaining time is spent out of the water, working on equipment and processing dredged material. According to experienced dredgers, processing materials from concentrates typically takes less than an hour (McCracken, 2008).

3.4.10 Encampments

The majority of California-resident dredgers (72%) and nearly all dredgers residing out of state (98%) camp near the locations they are mining for short to extended periods of time. California residents had a larger number of shorter trips to conduct suction dredging than non-California residents, who typically had a fewer number of longer trips (15 trips averaging 2 days per trip, vs. 4.5 trips averaging 7 days per trip, respectively).

Overall, suction dredgers reported staying in undeveloped federal campsites more frequently than in other types of campsites in 2008. Generally speaking, gold dredging encampments are not believed to be substantially different than the encampments of other park and waterway users except that they may have hazardous materials onsite (e.g., mercury, nitric acid) not found at other users' encampments. There are, however, a few common considerations made by suction dredge miners that influence the type and components of their camps.

The nature of the encampment depends on the presence of nearby facilities (e.g., restrooms, showers), how uncomfortable the environment is, personal requirements, and expected duration of stay. Larger public park areas and private mining clubs often offer campgrounds and lodging facilities. These more heavily used camping areas may also provide chemical toilets and basic shower facilities. And, in addition to RV's and campers equipped with restroom facilities, personal port-a-potties and storage tanks are commonly used by those who do not have easy access to existing facilities. It is illegal to dispose of this type of waste in areas other than approved dumping stations.

Miners generally plan ahead for supplies and food based on duration of stay. Depending on the location of the nearest town, supplies may not be available for replenishment. Shorter stays can utilize tents or tarps, while longer excursions may call for RV-type vehicles to transport and keep perishable supplies. Some mining clubs do not allow any permanent structures to be constructed on club property. Because fuel is an important component of a suction dredge operation, miners often bring their own supplies of fuels and store them near campsites and mining areas. Some mining clubs impose restrictions on the volume of fuel which can be brought to a property.

Secure locations for the storage of recovered gold and other valuable possessions at the camp, such as safes, are generally necessary. Some miners carry personal firearms; however, some mining clubs require that they not be displayed or used on camp property. Also, some clubs recommend that all garbage, supply, food, and equipment items be kept safely and in a clean manner to reduce hazards. This includes the clearing of garbage and debris prior to departure.

It seems likely that many suction dredge miners adhere to these basic rules and responsible behavior. CDFG has not systematically monitored encampments to develop a quantitative assessment. However, CDFG wardens have observed camps strewn with household garbage, industrial waste, large gas barrels, dilapidated vehicles, and human waste (CDFG, 1994; Sierra Fund, 2009).

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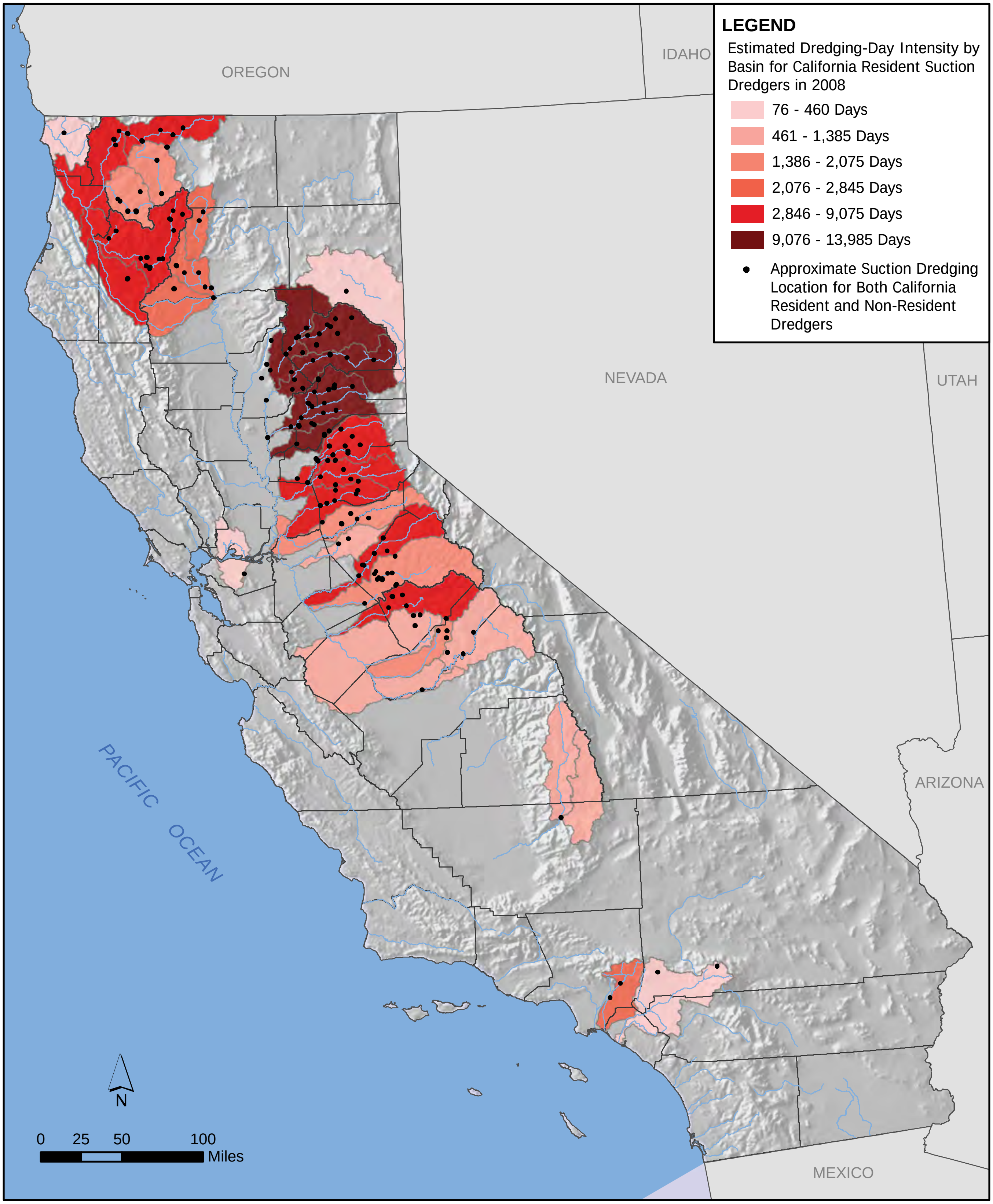
Figure 3-4
Subwatershed Occurrences of Suction Dredging



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Horizon WATER and ENVIRONMENT

Figure 3-5: Dredging-Day Intensity by Basin for California Resident Suction Dredgers, 2008

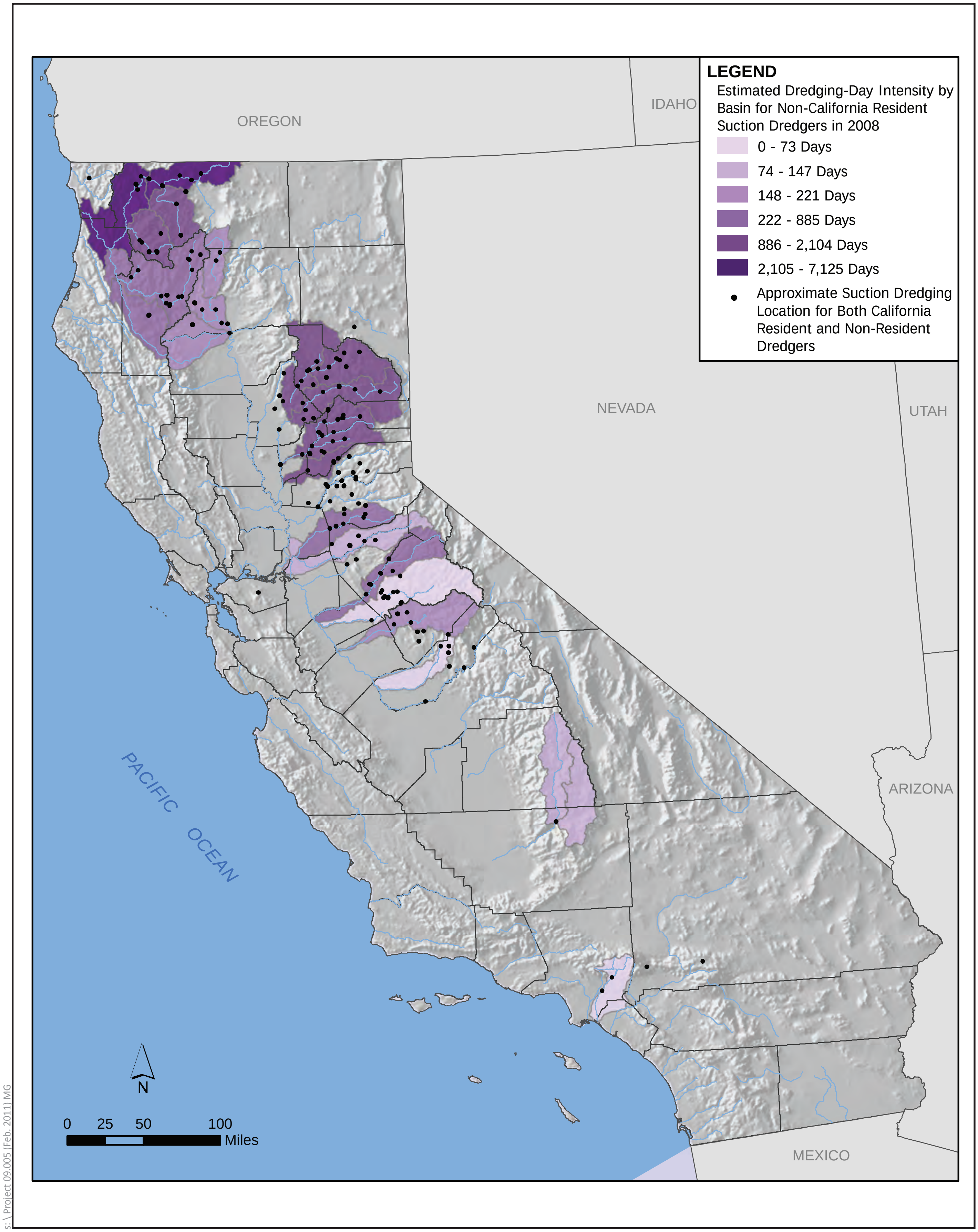

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Figure 3-6: Dredging-Day Intensity by Basin for Non-California Resident Suction Dredgers, 2008