OEHI Responses to CEC Workshop Requests Nos. A13 & A16

Amended Application for Certification
for
HYDROGEN ENERGY CALIFORNIA
(08-AFC-8A)
Kern County, California

January 2013

Workshop Request A13
As discussed in Section 5.0 of Appendix A-2, Biological Resources Study for Modified Alignment of CO2 Supply Line, please provide a copy of Oxy's 12-year site-wide maintenance Streambed Alteration Agreement.

Response:
OEHI holds a 12 year site-wide streambed alteration maintenance permit as required by 14 CCR Sections 1601 and 1603 of the Fish and Game Code. The current permit for OEHI expires in the year 2020. If it is determined that the activity may substantially adversely affect fish and wildlife resources within state jurisdictional waters, a Lake or Streambed Alteration Agreement will be prepared.

Workshop Request A16
Please provide a draft Revegetation Plan for areas that would be temporarily disturbed during construction. Please identify performance standards, success criteria, and a monitoring plan to determine the effectiveness of the revegetation activities.

Response:
08-AFC-8A, VOL II, Section 1.0 Executive Summary, Table 1-1, contains Mitigation Measure AES-2 that specifies time-tested procedures that have been successfully employed by OEHI at Elk Hills to allow temporarily disturbed native plant species to naturally reestablish themselves.

Mitigation Measure AES-2
In areas requiring major topographic adjustment (including but not limited to the CO2 EOR Processing Facility, satellite locations, new well sites, buried pipelines etc.), topsoil from existing grade to be cut/filled/trenched shall be removed and stockpiled during rough grading and/or trenching operations. Topsoil's shall be reapplied consistently across the new grades and stabilized to allow natural revegetation.

To support OEHI's position regarding natural revegetation we have provided Attachment A16-1, an evaluation report prepared by EG&G in May 1995. The report used quantitative data collected over a nine year period to demonstrate revegetation rates on various types of disturbed sites at Elk Hills Oil Field. The report also compares the rate of revegetation on reclaimed disturbed sites (e.g. a site typically disked, fertilized, seeded and mulched) versus the rate of revegetation on non-reclaimed disturbed sites.

ATTACHMENT A16-1
EVALUATION OF REVEGETATION RATES
EG&G REPORT

EVALUATION OF REVEGETATION RATES ON RECLAIMED AND NON-RECLAIMED DISTURBED SITES ON NAVAL PETROLEUM RESERVE NO. 1

Prepared by

David C. Anderson and Brian L. Cypher
EG&G Energy Measurements, Inc.

May 1995

ABSTRACT

An evaluation was conducted to examine revegetation rates on reclaimed and non-reclaimed disturbed sites on Naval Petroleum Reserve No. 1. The evaluation was conducted by examining qualitative data from cut and fill slopes and from disturbed sites other than cut and fill slopes, and quantitative data collected from reclaimed and reference sites. Revegetation rates appeared to be similar on reclaimed and non-reclaimed sites. On reclaimed sites, rates were faster on southern aspects and on certain types of disturbances. These results should not be considered conclusive due to limitations in the data and analyses. It is recommended that habitat reclamation goals be established and that an investigation be conducted to identify appropriate and cost-effective strategies for achieving reclamation goals.

INTRODUCTION

Since 1979, EG&G Energy Measurements, Inc. (EG&G/EM) has conducted a habitat reclamation program at the Naval Petroleum Reserves in California (NPRC). For the first several years of the program, various reclamation techniques were evaluated. An applied reclamation program was initiated in 1985. Historically disturbed sites that were no longer needed for oil and gas production activities were the major source of reclamation sites. Reclamation of these sites was essentially completed by 1992. Since then, newly disturbed sites have become the principle source of reclamation sites.

To date, 899 acres of disturbed land have been reclaimed. EG&G/EM conducts an annual monitoring program to assess revegetation rates and reclamation success on reclaimed sites. A site is considered to have been successfully reclaimed when vascular plant cover on the site is ≥70% of the cover on an adjacent undisturbed site. A preliminary examination of data suggested that the rate of revegetation on reclaimed sites may not be significantly different from the rate on non-reclaimed disturbed sites. In

Attach 9

1994, EG&G/EM was tasked to conduct an evaluation of the rate of revegetation on reclaimed disturbed sites (e.g., a site typically disked, fertilized, seeded and mulched) versus the rate of revegetation on non-reclaimed disturbed sites. This evaluation was completed in 1994 and preliminary results were reported at the January 1995 Endangered Species Advisory Committee meeting. The purpose of this report is to provide a detailed explanation of the evaluation, summarize results, and offer recommendations for future reclamation strategies at NPRC.

METHODS

Existing data and a limited amount of new field data were use to evaluate the rates of revegetation on reclaimed and non-reclaimed sites. Information used in the evaluation included data from (1) cut and fill slopes, (2) disturbances other than cut and fill slopes, and (3) a subsample of reclamation sites from which quantitative data were collected.

Cut and Fill Slopes

Data on cut and fill slopes were obtained from two sources. One set of data was generated by field-sampling 66 non-reclaimed cut and fill slopes. This sampling was completed in the fall and winter of 1993 as part of a task to determine the number of potential acres of cut and fill slopes on NPR-1 that could be considered for reclamation. The field sampling included qualitative estimates of total vascular plant cover on the cut or fill slope, and estimates of the percentage of plant cover on the cut or fill slope in relation to plant cover on adjacent undisturbed habitat.

To compliment the data from non-reclaimed cut and fill slopes, data were collected from reclaimed cut and fill slopes during the spring and summer of 1994, as part of the annual reclamation monitoring program. Sixty-one of the 150 cut and fill slopes that have been reclaimed to date were sampled qualitatively. The same data collected for the non-reclaimed cut and fill slopes were collected for the reclaimed cut and fill slopes.

Disturbances Other Than Cut and Fill Slopes

An analysis similar to that conducted for cut and fill slopes also was conducted for disturbances other than cut and fill slopes. These disturbances included soil borrow areas, well pads, pipelines, roads, and sumps. Data on reclaimed disturbances were collected as part of the annual reclamation monitoring program conducted by EG&G/EM. A total of 223 sites was evaluated. Thirteen non-reclaimed sites were identified and data were collected in the spring and summer of 1994. Total vascular plant cover was recorded on the disturbed or reclaimed site, and the percentage of cover in comparison to the amount of cover on the adjacent undisturbed habitat was also recorded. The effect of the type of disturbance on the rate of revegetation was originally going to be factored into the analyses. however, there were not enough sites within each

type of disturbance to conduct such an analysis.

Subsample Sites

The rate of revegetation on reclaimed sites was further evaluated using quantitative data collected over the past nine years. A subsample of 306 reclaimed sites on NPR-1 were sampled during the spring and summer of 1992 and 1993. These sites included various types of disturbances including soil borrow areas, well pads, pipelines, roads, and well sumps. Vascular plant cover, cover composition, and species density were measured on each of the sites. No cover estimates were made in undisturbed habitat adjacent to the reclamation site, so it was not possible to compare cover on a reclaimed site with cover on an adjacent undisturbed site, as was done for the other two tasks. To make such a comparison, cover data from 16 undisturbed reference sites on NPR-1 were used in lieu of the data for adjacent undisturbed habitat. Plant cover data were collected from the reference sites in the same two years data were collected from the reclaimed sites. Eight of the 16 reference sites are located on north aspects and eight are on south aspects. Cover data from the reference sites were averaged by aspect. Cover data from the reclaimed site was averaged by number of years since reclamation and by aspect, and then divided by average cover on the respective reference site (i.e., north or south). The comparison was similar to that conducted for the first two tasks, but quantitative data were used instead of qualitative data, and the standard for determining revegetation rates was the average cover measured on the reference sites and not cover on an undisturbed area adjacent to the reclaimed site. Analyses were conducted by aspect and by type of disturbance.

Analyses

All data were entered into a computer database, edited, proofed and summarized. Curvilinear regression analysis was conducted to delineate compare rates of revegetation. The amount of total vascular plant cover on the reclaimed site expressed as a percentage of the amount of cover on the adjacent undisturbed or reference sites was regressed against the number of years since disturbance (for non-reclaimed sites) or reclamation (for reclaimed sites). The resulting regression equation was used to predict time required for cover on disturbed sites to approximate 70% of the cover on adjacent undisturbed or reference sites.

RESULTS

Cut and Fill Slopes

Total vascular plant cover on cut and fill slopes was about 20% of the cover on adjacent undisturbed areas after two years on both reclaimed and non-reclaimed sites (Figure 1).

and the regression lines for the two types of sites were not significantly different. Eight years after reclamation, the amount of cover on both groups of sites had increased to about 55% of the adjacent undisturbed, although the percentage for the reclaimed sites was slightly lower than on the non-reclaimed. The percent cover of adjacent undisturbed approached 70% on non-reclaimed sites about 18 years after disturbance. Because data on reclaimed sites was limited to nine years after the disturbance, it was not possible to determine the time it would take for cover on reclaimed sites to attain 70% of adjacent undisturbed sites.

Disturbances Other Than Cut and Fill Slopes

Time since disturbance ranged from one year to nine years for reclaimed sites, and from one year to 50 years for the non-reclaimed sites. The amount of cover on the reclaimed sites was 17% of adjacent undisturbed after the first growing season, increased to 40% after the second growing season, and was 71% after the fifth growing season (Figure 2). On non-reclaimed sites cover was 22% of adjacent undisturbed one year after the disturbance, 78% by the fourth year, and 95% and 85% on single sites representing the ninth and sixteenth year after disturbance, respectively (Figure 2). The regression lines for the two types of sites were not significantly different.

Subsample Sites

Based on the quantitative data collected from subsample sites, the rate of revegetation was different on north and south aspects. Cover on reclaimed sites on northerly aspects was 47% of the average cover measured on the eight respective reference sites after one growing season. It increased to 71% by the third year, then fluctuated between 56% and 74% for the next five years. Cover on reclaimed sites located on southerly aspects followed a similar early trend, increasing to 72% of average cover on reference sites by the third year, but then increased consistently to 94% by the eighth year after reclamation (Figure 3).

The type of disturbance appears to also have an effect on the rate of revegetation. On disturbances resulting from the construction of well pads, well sumps and pipelines, average vascular plant cover exceeded 70% of the average cover measured on the reference sites three years after the sites were reclaimed. Average vascular plant cover on reclaimed roads fluctuated from 54% after the first growing season, to 77% and 88% in the seventh and eighth growing seasons. Average cover on soil borrow areas in relation to the amount of cover on the reference sites was not consistently over 70% until the fourth growing season (Figure 4).

DISCUSSION

Cut and Fill Slopes

Plant cover on reclaimed cut and fill slopes is not likely to equal that on an adjacent undisturbed area. Cut and fill slopes have been severely disturbed and the capacity of the site to support a vegetative cover equal to that prior to the disturbance has been reduced. Usually, the topsoil has been removed and the slope altered, which may inhibit plant establishment. These same conditions increase the difficulty of successful habitat restoration.

Based on the data collected, reclamation of cut and fill slopes does not appear to accelerate the rate of revegetation. The two curves generated from the regression analysis are essentially the same for the first 10 years. Data for non-reclaimed cut and fill slopes is available for 50 years after disturbance and suggests that vascular plant cover on a cut and fill slope will reach 70% of the cover on an adjacent undisturbed site after 18 years. Data on reclaimed sites is only available for nine years after the time of disturbance. However, average vascular plant cover on the reclaimed cut and fill slopes was 62% after nine years. On the non-reclaimed cut and fill sites, cover was 61% after nine years suggesting that the rate of revegetation on the reclaimed cut and fill slopes is similar to that on the non-reclaimed slopes.

Disturbances Other Than Cut and Fill Slopes

Vascular plant cover on the more typical disturbances such as well sumps, soil borrow areas, abandoned roads, pipeline right-of-ways, and abandoned well pads, is more likely to approach that measured on adjacent undisturbed sites, and at a more rapid rate than was observed on cut and fill slopes because the disturbance is less severe. In some cases the topsoil has not been removed or has been replaced. The slope is usually not altered, and typical reclamation practices, such as ripping compacted soils and adding straw mulches, can be implemented, which is not the case with cut and fill slopes.

Based on the variability observed in the analyses conducted, the rate of revegetation on reclaimed and non-reclaimed sites is similar. The time required for cover on disturbed sites to attain 70% of the cover on adjacent undisturbed sites was about five years for non-reclaimed sites and about eight years on reclaimed sites. These results must be viewed with some caution because only 13 non-reclaimed sites could be located. Thus, the analysis for non-reclaimed sites was based on a small sample size, particularly in comparison to the 223 reclaimed sites. Also, many of the non-reclaimed sites were old firebreaks in which topsoil was not removed and compaction was not a problem.

Subsample Sites

Analysis of the quantitative data suggests that aspect has an effect on the rate of

revegetation. Cover on south aspect sites reached 70% of that on undisturbed reference sites in about three years, while cover on north aspect sites percent was estimated to be 67% of that on the reference sites after eight years, which is slightly below the goal of 70%. It was anticipated that the rate of revegetation on north slopes would be faster than the rate on south slopes because north slopes are generally more productive, (i.e., higher cover and plant production). The data collected do not refute this. Instead, the more rapid attainment of the success criteria on south aspects is likely a result of the lower cover on south aspects versus north aspects. Thus, less cover is needed on reclaimed sites to equal 70% of the cover on south aspect reference sites.

The type of disturbance also appears to affect the rate of revegetation. The rate of revegetation for disturbances resulting from the construction of well pads, pipelines or sumps was faster than the rate for disturbances such as roads and soil borrow areas. This may be due to the fact that on soil borrow areas much of the topsoil is removed and not replaced, producing more stressful conditions for plant growth and reestablishment. The reason(s) for the slower restoration rate for road disturbances are not as clear. A possible explanation is that roads are more likely than other sites to be redisturbed after reclamation thus increasing the time required to revegetate. Although the type of disturbance may influence the rate of revegetation, the goal of 70% of the cover on the reference sites is attained within five years regardless of the type of disturbance.

Value of Habitat Reclamation

Based on the data collected and the analyses conducted, the rate of revegetation on reclaimed sites does not appear to be different from the rate on non-reclaimed sites. However, this evaluation was not based on a strong experimental design, and the results should be not be considered conclusive. Weaknesses in this evaluation included small sample sizes for non-reclaimed sites, disproportionate representation of disturbance types and terrain locations between reclaimed and non-reclaimed sites (e.g., many non-reclaimed sites were old firebreaks in flat terrain), and the effect of variable precipitation among years. Interestingly, data on both reclaimed and non-reclaimed sites suggest that the overall rate of revegetation is less than 18 years, which is a commonly cited standard. In fact, data suggest that as few as five years may be required for a disturbed site to attain 70% of the cover found on undisturbed sites.

This evaluation was based on total vascular plant cover and the rate at which plant cover established on sites. Although this is one measure of reclamation success, other variables may be equally important to consider. Such variables may include plant species composition, plant community structure, rate of cryptogamic crust formation, extent of soil erosion, similarity to adjacent undisturbed habitat, and quality of habitat for animals, particularly listed species.

Ideally, goals should be established for reclaiming disturbed habitat. Then, appropriate strategies and techniques can be selected and implemented. Finally, the value and

success of habitat reclamation should be assessed based on achievement of the established goals. For example, if a goal of habitat reclamation is to benefit listed species, then previous reclamation techniques may not be the most effective. Based on data collected by EG&G/EM, giant kangaroo rats and blunt-nosed leopard lizards appear to prefer areas with reduced shrub cover. Blunt-nosed leopard lizards and Hoover's wooly-star appear to be most abundant in areas with reduced ground cover. With respect to kit fox prey, areas with reduced shrub cover may support more kangaroo rats, while areas with greater shrub cover may support more rabbits. However, areas with higher shrub densities may also be more suitable to coyotes and bobcats which compete with and prey on kit foxes. Another potential goal of habitat reclamation might be to emphasize establishment of local plant species and/or use local genetic stock. In this situation, a different seed source might need to be identified. Topsoil from construction sites on NPRC would be another source of local genetic stock. Studies conducted by EG&G/EM from 1981-83 found that spreading topsoil on disturbed resulted in a very diverse ground cover, excellent native shrub establishment, and a rate of revegetation similar to that achieved by seeding. If the goal of reclamation is to establish cover at the lowest possible cost, then simple site preparation or topsoil spreading might be considered. Thus, habitat reclamation goals need to be established before an appropriate reclamation strategy and success criteria can be identified.

RECOMMENDATIONS

1. Determine requirements and need for habitat reclamation on NPRC.

2. Establish goals for habitat reclamation.

3. Design and implement an investigation to identify the most effective and cost-effective strategy for achieving habitat reclamation goals. Depending upon the goals established, possible strategies include natural revegetation, site preparation followed by natural revegetation, topsoil spreading to introduce local seed sources, or mechanical seeding.

4. Once an optimal strategy is identified, implement this strategy on an operational basis to meet requirements for habitat reclamation on NPRC.

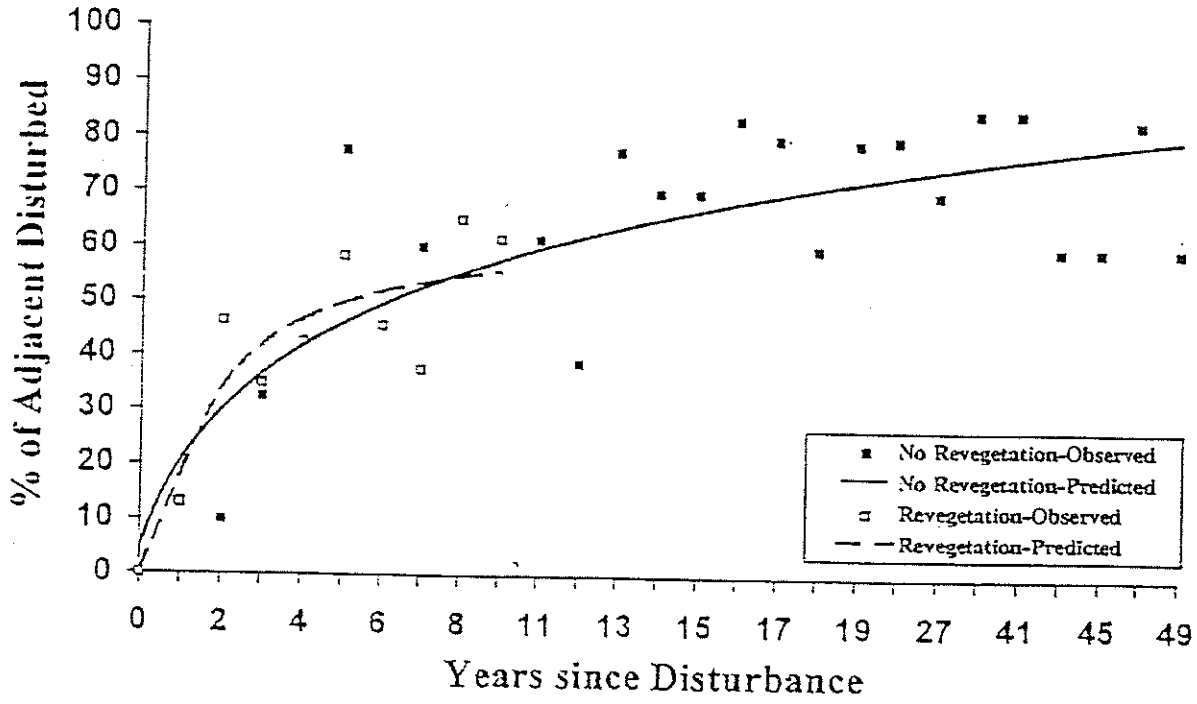

Figure 1. Assessment of revegetation rates on revegetated vs. non-revegetated cut/fill slopes on the Naval Petroleum Reserves in California, Kern County, California, 1994.

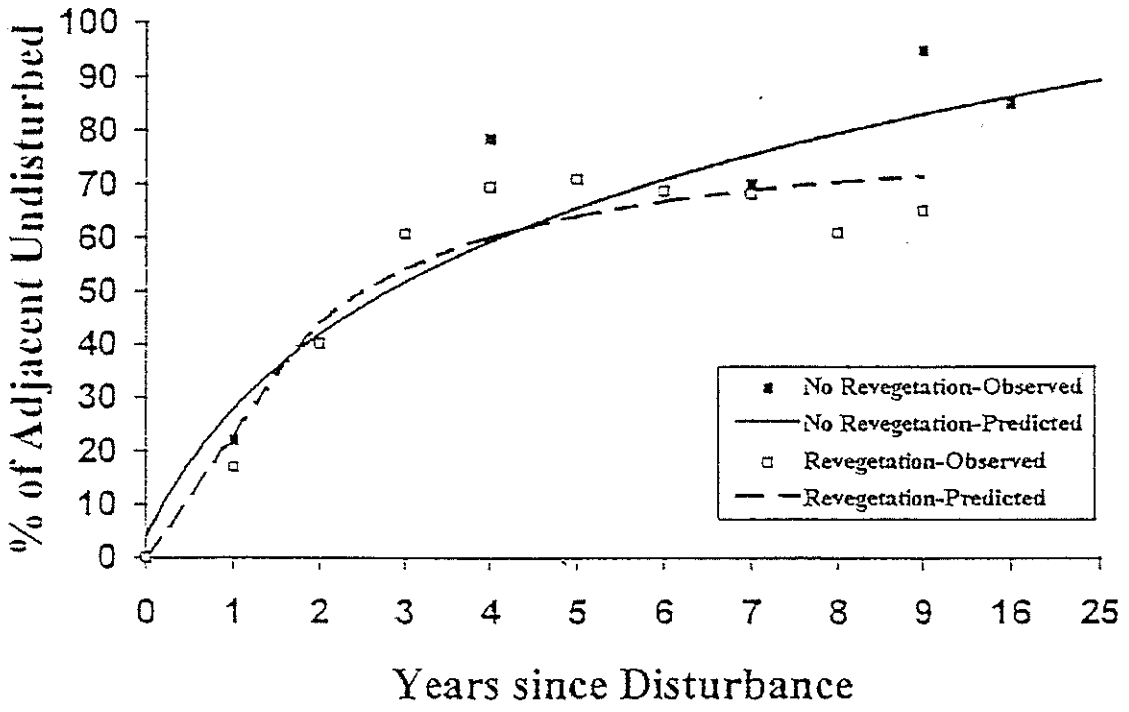

Figure 2. Assessment of revegetation rates on revegetated vs. non-revegetated non-cut/fill slopes on the Naval Petroleum Reserves in California, Kern County, California, 1994.

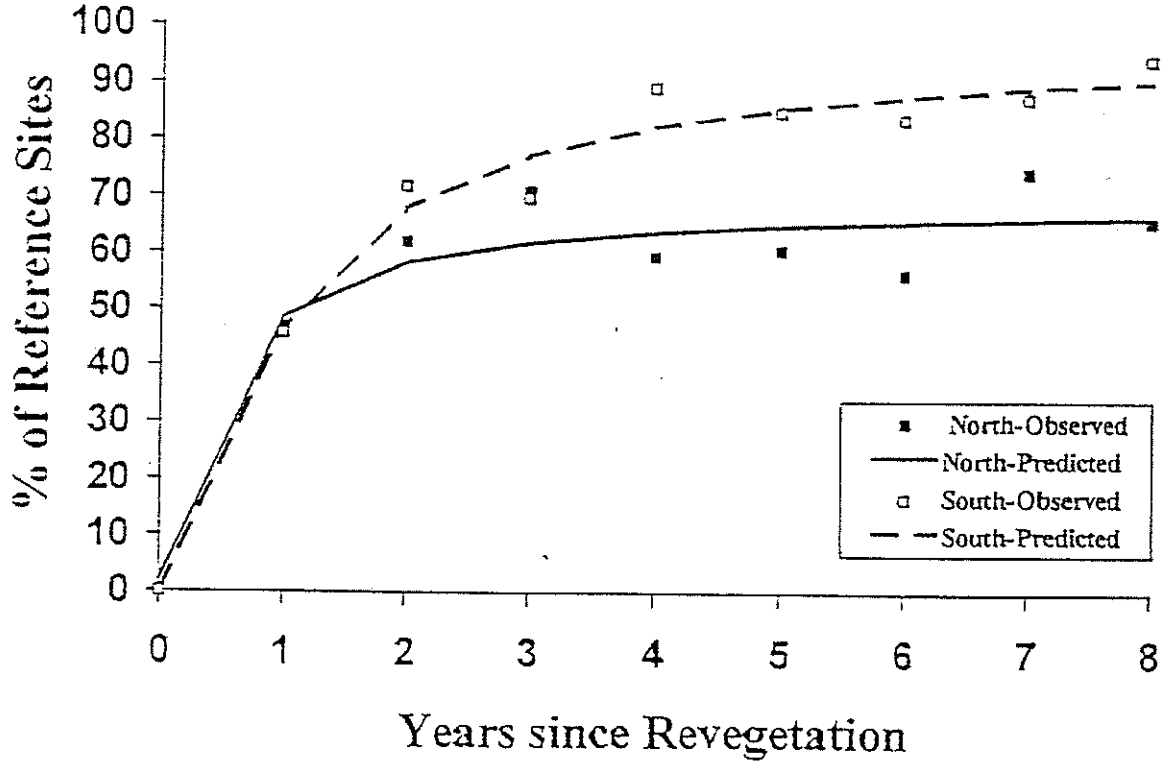

Figure 3. Assessment of revegetation rates on subsample sites by aspect on the Naval Petroleum Reserves in California, Kern County, California, 1994.

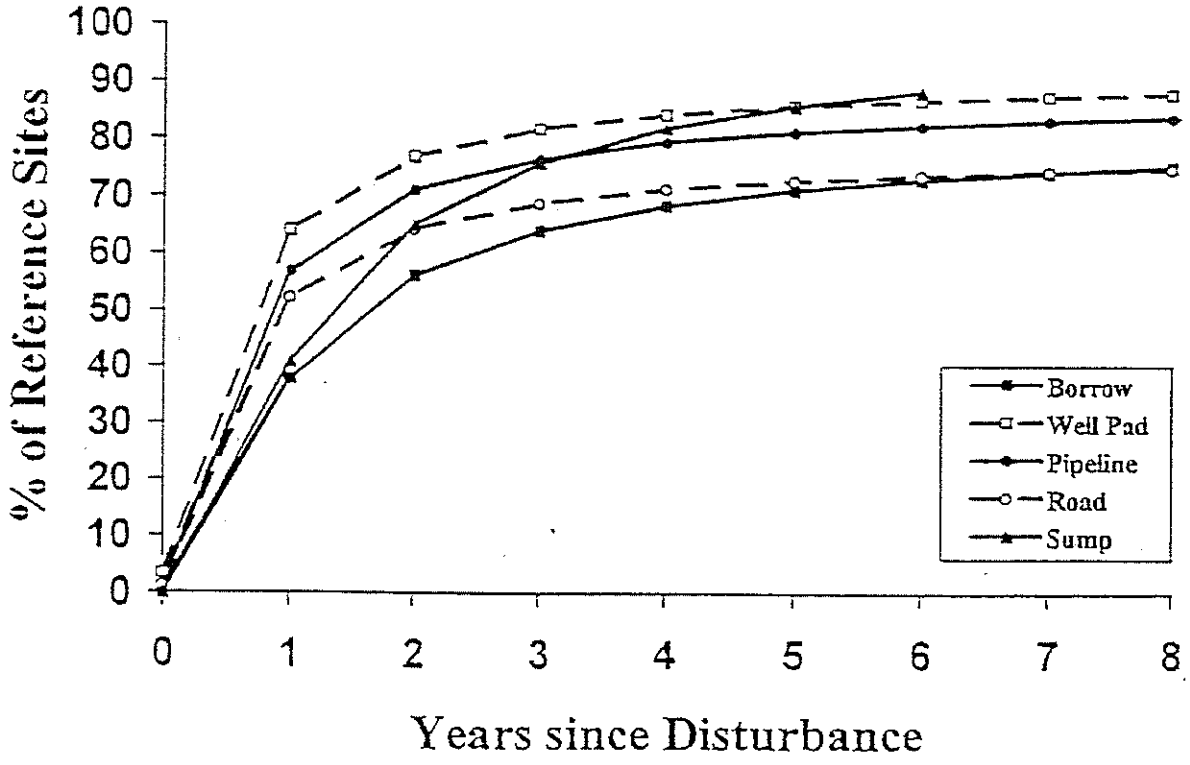

Figure 4. Assessment of revegetation rates on subsample sites by disturbance type on the Naval Petroleum Reserves in California, Kern County, California, 1994.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT
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AMENDED APPLICATION FOR CERTIFICATION FOR THE HYDROGEN ENERGY CALIFORNIA PROJECT

Docket No. 08-AFC-08A
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(Revised 12/24/12)

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After docketing, the Docket Unit will provide a copy to the persons listed below. Do not send copies of documents to these persons unless specifically directed to do so.

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DECLARATION OF SERVICE

I, Dale Shileikis, declare that on January 21, 2013, I served and filed copies of the attached OEHI Responses to CEC Workshop Requests Nos. A13 & A16, dated January, 2013. This document is accompanied by the most recent Proof of Service list, which I copied from the web page for this project at: http://www.energy.ca.gov/sitingcases/hydrogen_energy/index.html.

The document has been sent to the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, as appropriate, in the following manner:

(*Check one*)

For service to all other parties and filing with the Docket Unit at the Energy Commission:

X I e-mailed the document to all e-mail addresses on the Service List above and personally delivered it or deposited it in the US mail with first class postage to those parties noted above as "hard copy required"; OR

____ Instead of e-mailing the document, I personally delivered it or deposited it in the US mail with first class postage to all of the persons on the Service List for whom a mailing address is given.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that I am over the age of 18 years.

Dated: 1/21/13