Invasive Weed Mapping Project at
Humboldt Bay National Wildlife Refuge
Fall 2004

Prepared by
Patti Clifford, Natural Resource Specialist, HBNWR
and Emily Walter, Restoration Coordinator, FOD
for Humboldt Bay National Wildlife Refuge Complex
P.O. Box 576
Loleta, CA 95551
March 8, 2005

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INTRODUCTION

Exotic plants are non-native plant species growing outside of their natural range and dispersal potential. Invasive plant species displace natives, change species composition, community structure, or ecosystem function (Randall and Hoshovsky 2000). Invasive species are considered the second largest threat to biological diversity world-wide. Compared to other biodiversity threats, invasive exotic plants represent a complex problem that is difficult to manage and has long-lasting effects (Randall and Hoshovsky 2000). In California 17.7% of plant species found in the wild are exotic (Randall et al. 1998). California's exotic flora is richest in the coastal regions comprising approximately 50% of the species. Early settlement, heavy population, mild winters and summer dry seasons are all factors influencing the number of exotics found along the coast (Randall et al. 1998). While there is no record of exotic plants causing a native to go extinct, their ecosystem–level effects should be recognized. Invasive plant species not only displace native plant species, hybridize with native plant species, and facilitate invasions by non-native animals and plants (Randall 1998), they can change substrate stability, disturbance regimes, and soil chemistry (D'Antonio 1998).

Invasive species have been identified as the number one wildlife threat in the Refuge Threats and Conflicts database. Invasive species inventories (including maps) enable managers to quantify the effects of invasive species on native ecosystems, prioritize areas for treatment, and monitor control efforts. The Humboldt Bay National Wildlife Refuge (HBNWR) (Figure 1) began a volunteer-assisted Invasive Weed Mapping Project in September 2003. This initial pilot project was funded by the U.S. Fish and Wildlife Service. During the 2003 season; invasive weed priority criteria, mapping methodologies, PDA/GPS/GIS instructions, and volunteer training guides were developed. Several subunits within the Salmon Creek Unit were surveyed for 24 invasive plant species. The pilot project was highly successful (Walter and Clifford 2003) and was funded for the 2004 season with Challenge Cost Share money.

The 2004 mapping season emphasized the use of stipends for volunteers, mapping roadsides as vectors for invasives dispersal, and the completion of the mapping of the A and D rated species in the Salmon Creek Unit. The development of a comprehensive weed management plan will direct further mapping and control efforts to accomplish invasive weed control goals.

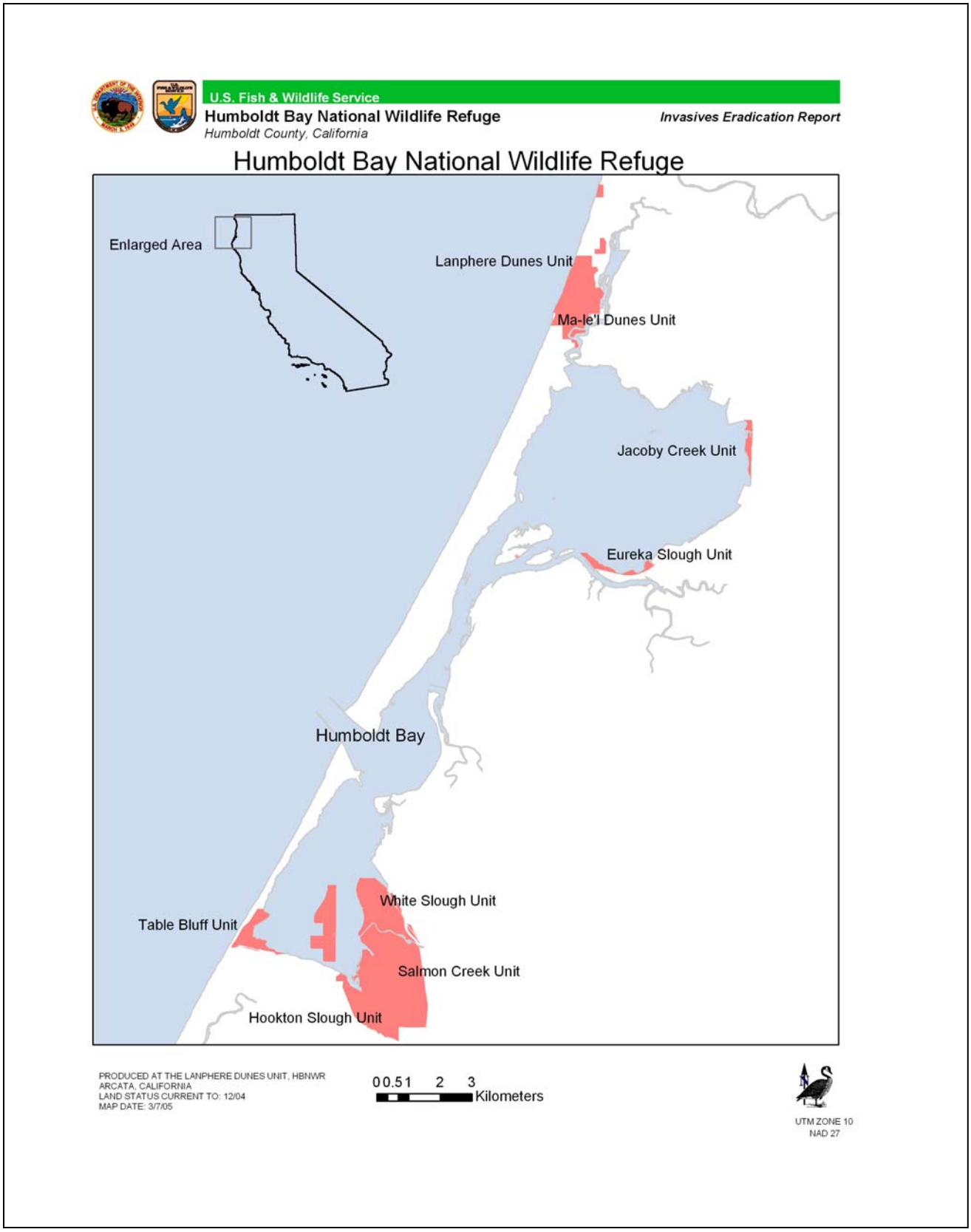


Figure 1. Location of the Humboldt Bay NWR.

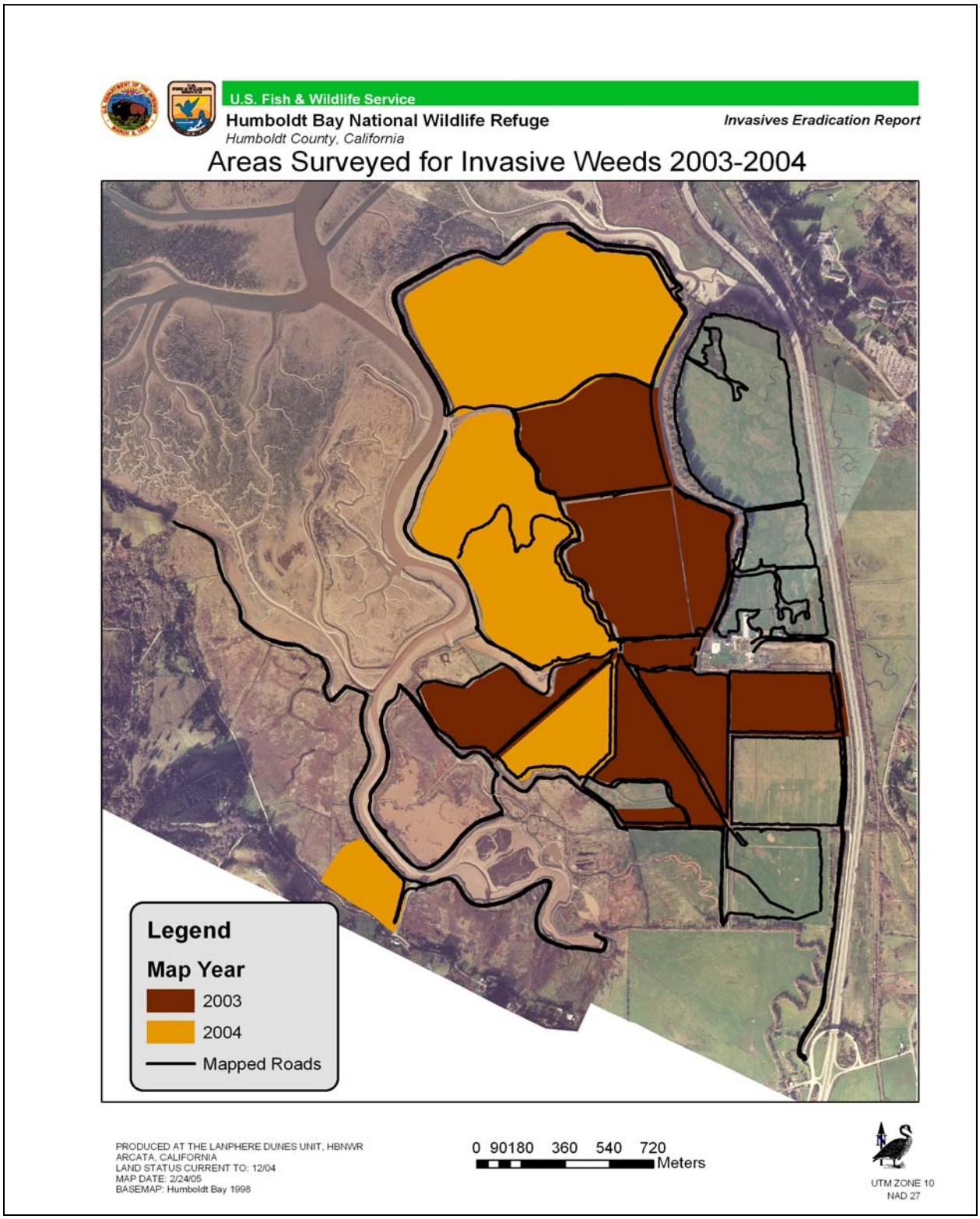


Figure 2. Areas of the Salmon Creek and Hookton Slough Units surveyed for invasive weeds 2003-2004.

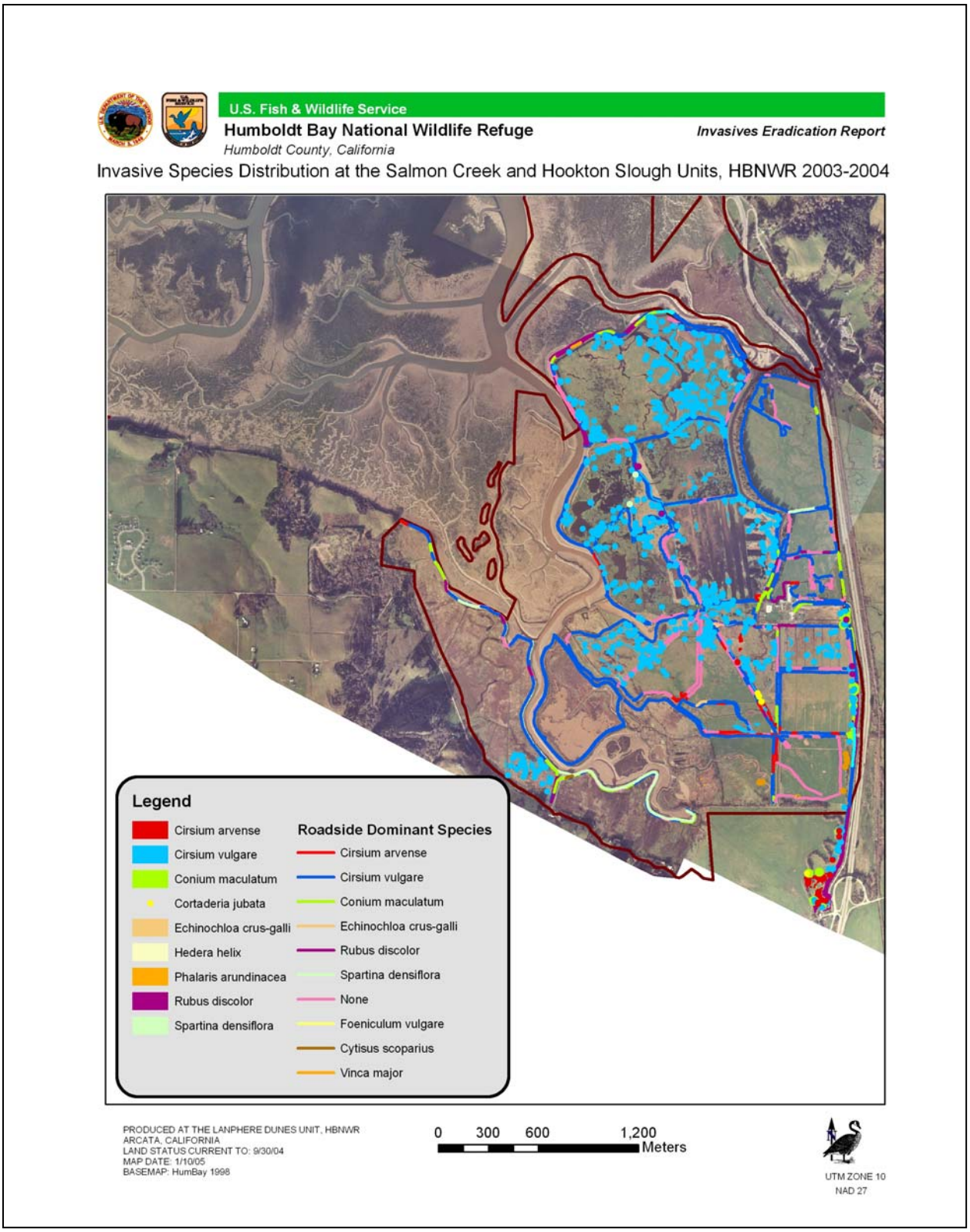


Figure 3: Invasive species mapped in the 2003-2004 season.

List of Invasive Species Surveyed in the 2003-2004 Mapping Seasons

A1. Weeds of known high invasiveness, known to be present, with known control strategies.

Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Conium maculatum	poison hemlock
Cortaderia jubata	pampas grass
Cyperus esculentus	parking lot sedge
Foeniculum vulgare	fennel
Hedera helix	English ivy
Phalaris arundinacea	reed canarygrass
Rubus discolor	Himalaya berry
Cytisus scoparius	Scotch broom

A2. Weeds of lesser invasiveness but in early colonization stage, with known control strategies

Echinochloa crus-galli	barnyard grass
Vinca major	periwinkle

D. Invasive Species on the refuge to "watch list" that were not found within the mapped areas.

Oxalis pes-caprae	Bermuda buttercup
Acacia spp.	acacia
Alisma lanceolatum	water plantain
Bellarida trixago	bellardia
Calystegia sylvatica	bellardia
Erica lusitanica	Spanish heath
Genista monspessulana	French broom
Hypericum perforatum	Klamathweed
Oenothera glazioviana	evening primrose
Oxalis rubra	purple oxalis (clover)
Vicia[benghalensis	purple vetch
Zostera japonica	invasive eelgrass

Invasive Species Descriptions, Distribution and Suggested Control Methods

Barnyard grass (*Echinochloa crus-galli*) is an annual in the Poaceae introduced from Europe and India. Each plant can produce as many as 40,000 seeds. This species is ranked 3rd among the world's worst weeds, and can consume 60-80% of available soil nitrogen in one growing season (Royer and Dickinson 1999). Seeds can survive up to 12 years.

HBNWR Distribution: *Echinochloa* was found at three locations on the Salmon Creek Unit during the 2003-2004 mapping season (Figure 4). Its distribution and abundance is limited within the unit.

Control: Regularly removing plants before seed set can prevent infestation (DiTomaso and Healy 2003).

Canada thistle (*Cirsium arvense*) a perennial in the Asteraceae is native to southeastern Europe and the eastern Mediterranean area. *C. arvense* spreads by seed. Once established it spreads by horizontal roots, up to several meters per year. Small root segments are easily spread and can propagate a new plant. It is considered one of the most serious pests to agriculture. Once established it is a strong competitor for water and nutrients needed by native plants. It produces allelopathic chemicals that assist in displacing natives. Plants can produce over 5,000 seeds. Seeds can stay viable up to 21 years. Approximately 90% of seeds germinate within one year (Bayer 2000).

HBNWR Distribution: *Cirsium arvense* has a limited number of occurrences at the Salmon Creek and Hookton Slough Units in 2003-2004 (Figure 5).

Control: There is not an easy control method for *C. arvense*. All methods require follow-up. Monitoring of control sites to locate and eliminate seedlings and resprouts is essential. Manual removal must be persistent and careful to remove any root fragments. It must start when plants first emerge and be repeated twice a year for the first four years, after rain or irrigation by a month to six weeks Repeated mowing at three-week intervals will weaken the plant (Bayer 2000).

Scotch broom (*Cytisus scoparius*) is a perennial shrub in the Fabaceae. It is native to Europe and Northern Africa. *Cytisus* has nitrogen-fixing bacteria on plant roots. One medium sized shrub can produce over 12,000 seeds per year. This species can form monospecific stands. It is difficult to control because of its substantial long-lived seedbank. *Cytisus* acidifies the soil and its nitorgen fixing ability allows it to establish on poor soils and outcompete natives. Seeds can persist 5-30 years in the soil (Bossard 2001).

HBNWR Distribution: *Cytisus* was only found along a roadside on the Hookton Slough Unit (Figure 6). Most of the Hookton Unit has yet to be mapped, further occurrences may be found.

Control: Removing plants with a weed wrench is effective. Monitoring and removal of seedlings for 5-10 years is necessary.

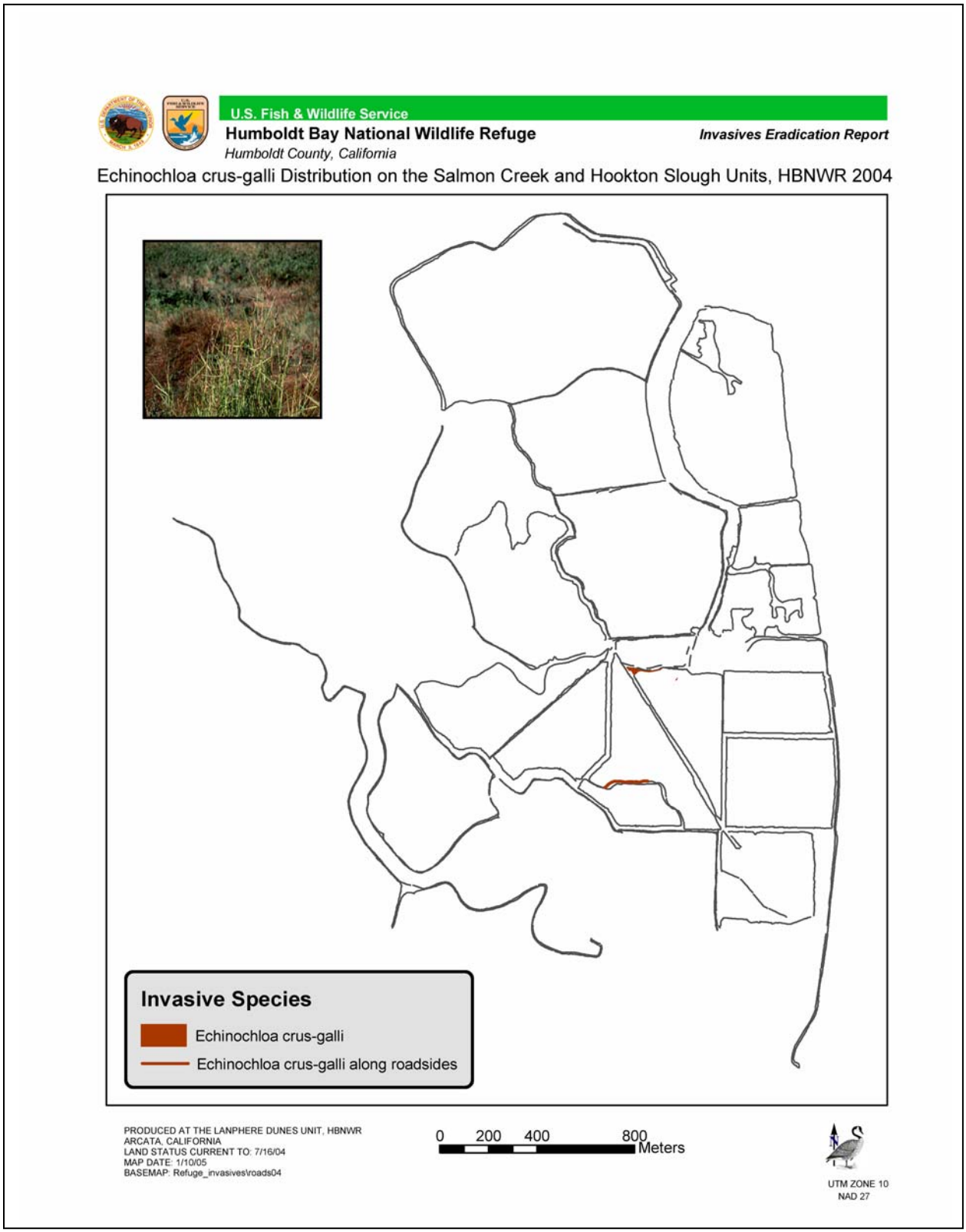


Figure 4. Occurrences of *Echinochloa crus-galli* at Humboldt Bay NWR 2003-2004.

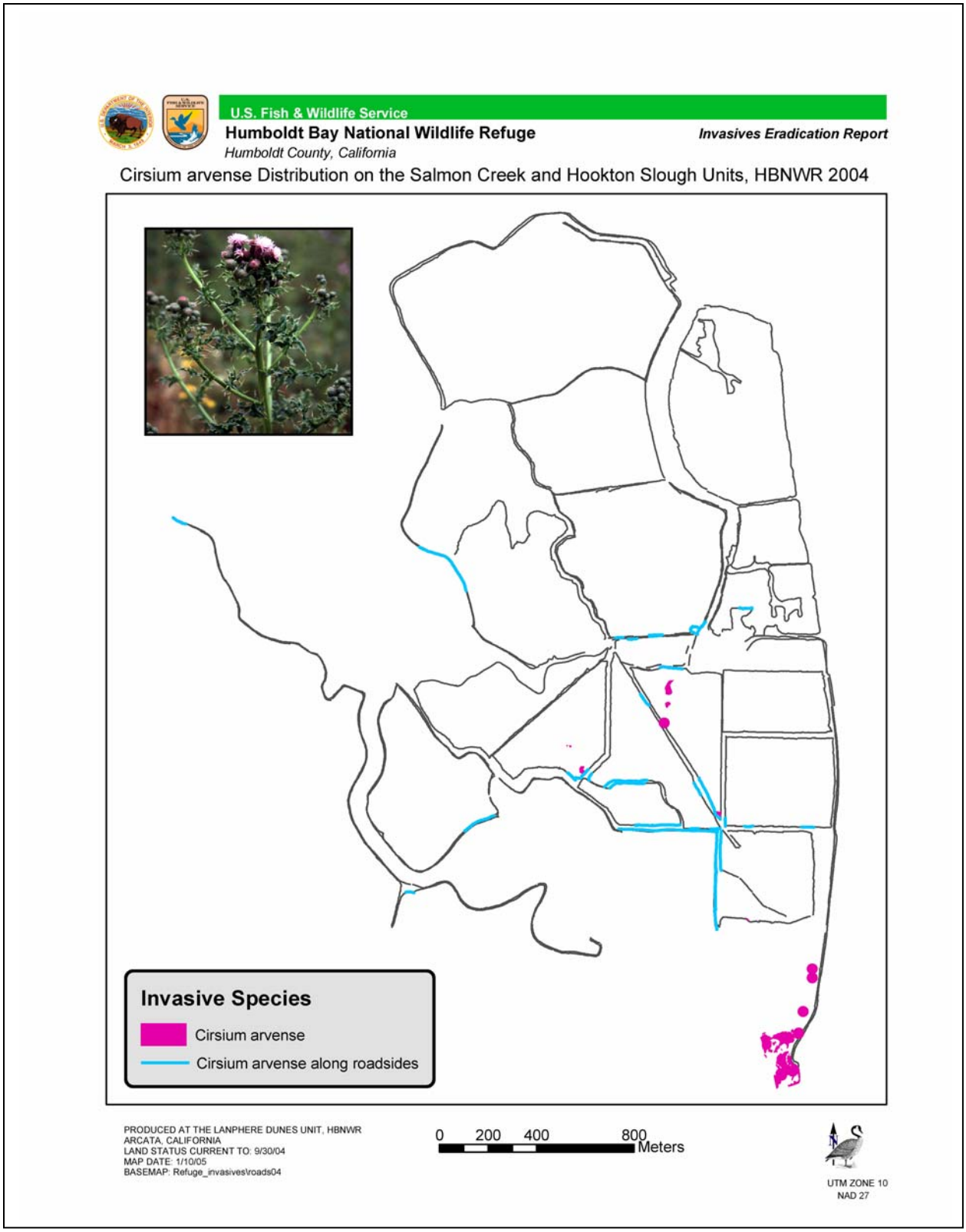


Figure 5. Occurrences of *Cirsium arvense* at the Humboldt Bay NWR 2003-2004.

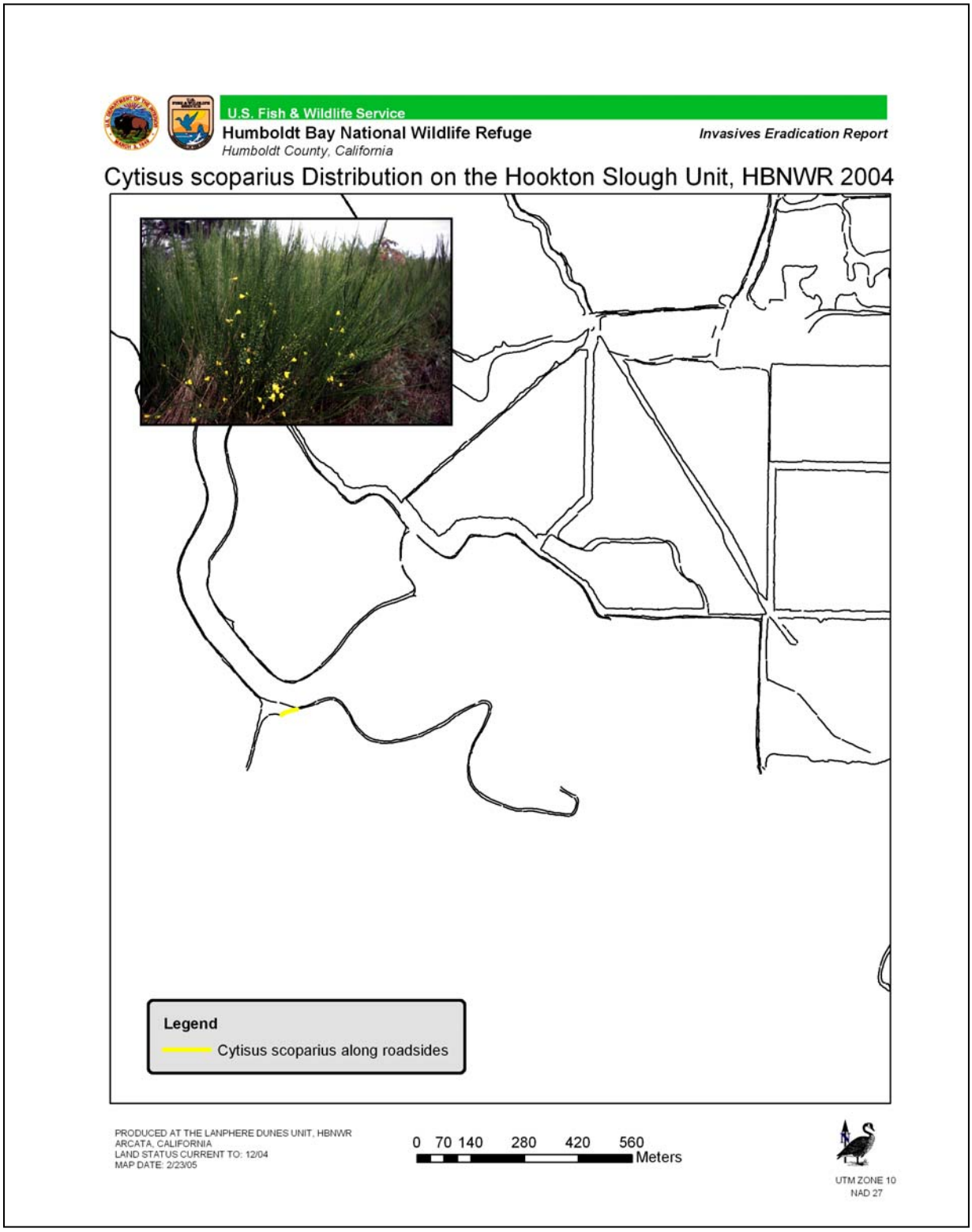


Figure 6. Occurrences of *Cytisus scoparius* at the Humboldt Bay NWR 2003-2004.

Bull thistle (*Cirsium vulgare*) is a biennial in the Asteraceae. *C. vulgare* is native to Europe, western Asia, and North Africa. It reproduces only by seed and one plant can produce tens of thousands of seeds. This species has high seed viability of up to 90%.

HBNWR Distribution: *Cirsium vulgare* was found virtually everywhere in the Salmon Creek unit and along all of the roads (Figure 7).

Control: Mowing or hand cutting shortly before plants flower (June-August) is effective. If they are cut too early plants can resprout and flower. Uneven flowering times necessitate more than one mowing treatment. Cut stems may have to be removed as the seeds can mature.

Poison hemlock (*Conium maculatum*) is a biennial in the Apiaceae. *Conium* is native to Europe, North Africa, and Asia. This species reproduces only by seed. It is highly competitive and prevents establishment of natives by overshading. The seed is fully developed by mid-June. Seeds disperse from September through February. Eighty-five percent of the seeds are ready to germinate when dispersed. The others are dormant and can remain in the seedbank for up to 3 years. Germination takes place all months of the year except for April, May, and July.

HBNWR Distribution: *Conium* was found in a limited number of occurrences in the subunits. Most occurrences are in subunits along Hookton Road. However, there are many occurrences along the roadsides in both the Salmon Creek and Hookton Units (Figure 8).

Control: Hand-pulling is effective prior to seed set and is easiest when the soil is wet. All of the root doesn't have to be removed. Mowing is also an effective removal method. This method requires a spring and late-summer mowing.

Jubata grass (*Cortaderia jubata*) is a perennial in the Poaceae. It is native to Argentina and the Andes of Bolivia, Peru, Chile, and Ecuador. *Cortaderia* crowds out native plants and can outcompete seedling trees. Reproduction of *Cortaderia* is asexual. All plants produce only female flowers. No pollination is necessary for seed production. Plants can flower twice in one season. Each inflorescence can produce 100,000 seeds. *Cortaderia* can also reproduced vegetatively from tiller fragments. There is no seedbank, so critical strategy is to remove all flowering plants in a given area at once.

HBNWR Distribution: *Cortaderia* occurs only in a couple of locations in the Salmon Creek and Hookton Slough Units (Figure 9).

Control: Pulling or hand-grubbing is highly effective. The crown and top section of roots must be removed to prevent resprouting. (DiTomaso in Bossard et al 2001.)

Reed canary grass (Phalaris arundinaceae) is a cool season, rhizomatous, perennial in the Poaceae . It is native to Eurasia. It thrives in areas with frequent and extreme fluctuations in water levels. It can reproduce vegetatively by rhizomes and sexually by its abundant seeds. Each inflorescence can produce approximately 600 seeds. Establishment from seeds is low and most

recurring populations are from rhizomes (tnc). Established plants form dense seedbanks that last 1+ years. Large plants can outcompete most native plant species.

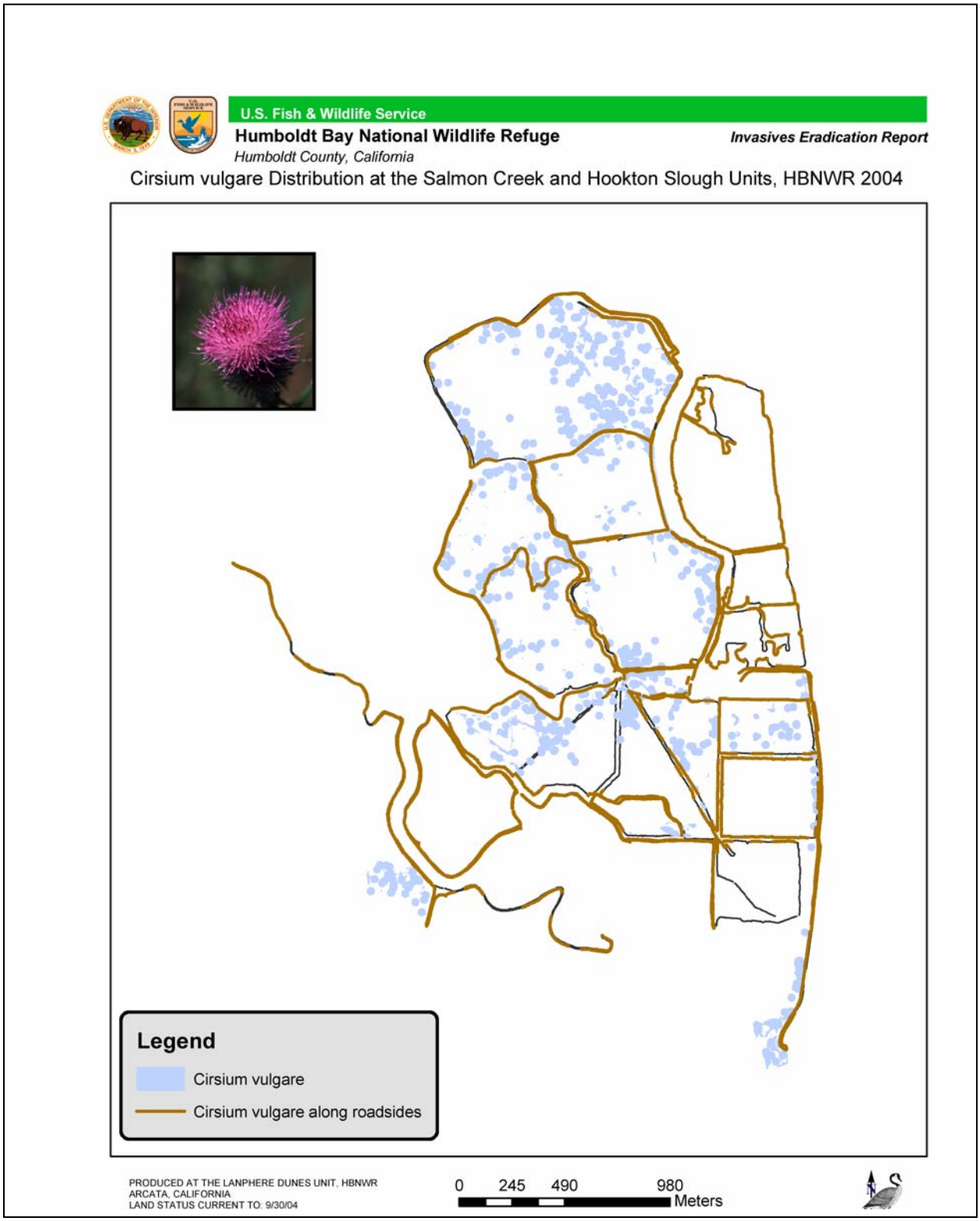


Figure 7. Occurrences of *Cirsium vulgare* at the Humboldt Bay NWR 2003-2004.

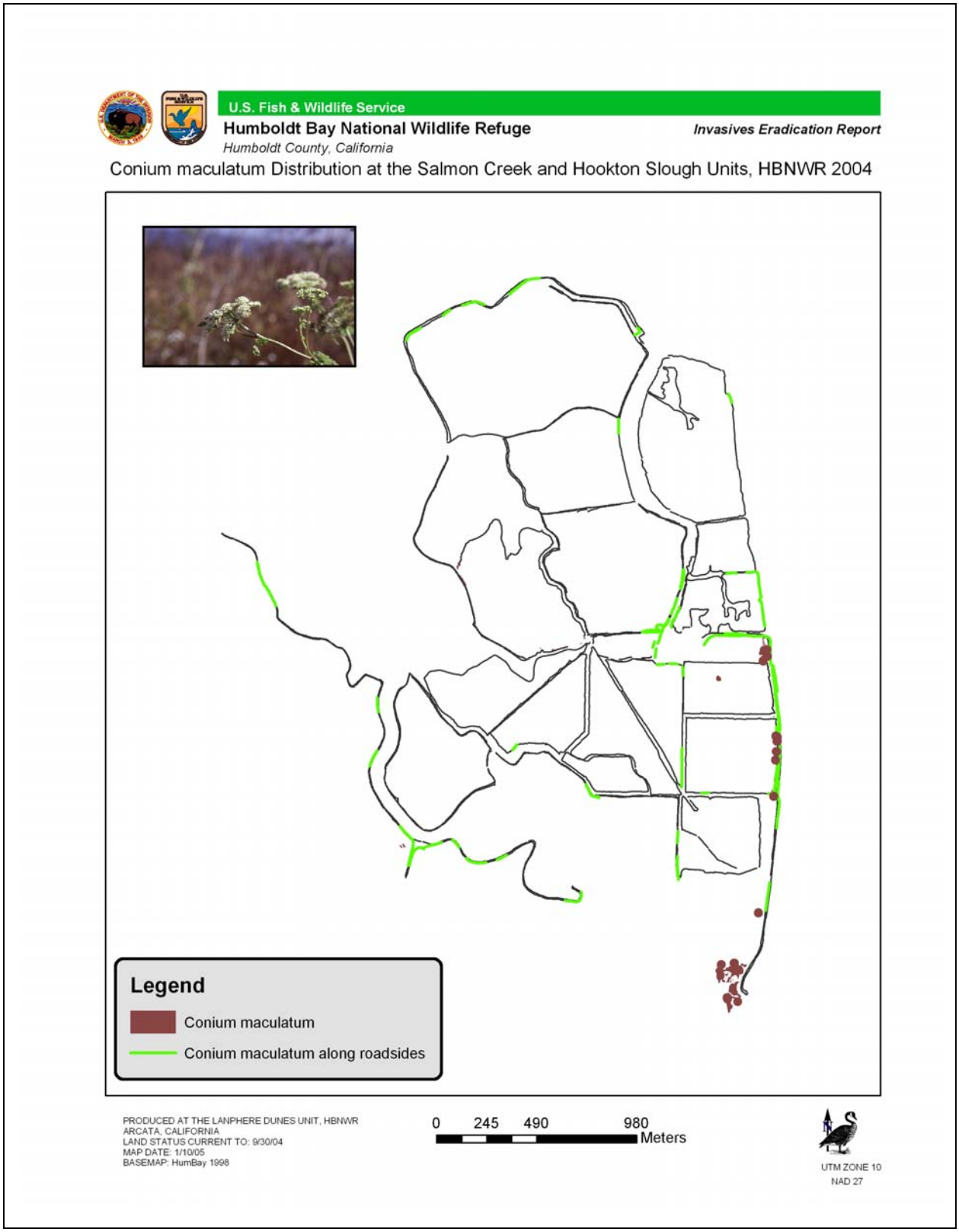


Figure 8. Occurrences of *Conium maculatum* at the Humboldt Bay NWR 2003-2004.

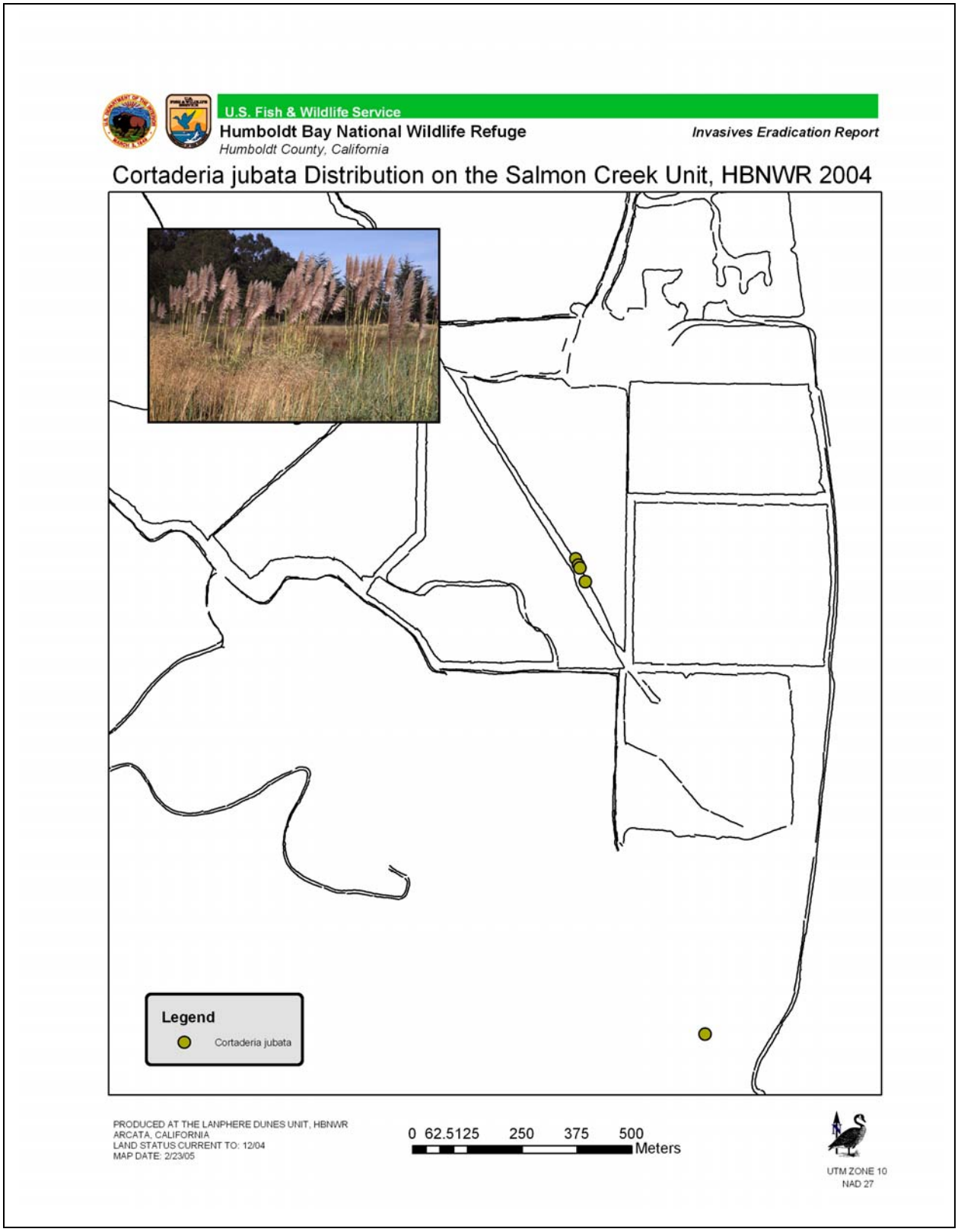


Figure 9. Occurrences of *Cortaderia jubata* at the Humboldt Bay NWR 2003-2004.

HBNWR Distribution: There were only a few occurrences of *Phalaris* in the Hookton Slough Unit (Figure 10).

Control: Manual or mechanical digging is successful if the entire root mass is removed. Follow-up is necessary for resprouts. Five to ten years of monitoring and follow-up are necessary to prevent re-infestation. Mowing and grazing are ineffective at controlling *Phalaris* populations.

English ivy (*Hedera helix*) is a perennial in the Araliaceae. It is native to England, Ireland, the Mediterranian region, and northern Europe. English ivy can alter successional patterns in the forest by inhibiting the regeneration of understory plants.
Hedera reproduces vegetatively and by seed (Reichard in Bossard et al. 2001).

HBNWR Distribution: *Hedera* occurs in one location, outside the refuge (Figure 11).

Control: Hand removal is effective. Careful attention to the removal of all the rhizomes is important. Removal of aerial vines will prevent the plant from producing seeds.
Aerials can be severed and the roots of the plants removed. This method necessitates two treatments the first year and an annual follow-up for four to five years.

Himalaya blackberry (*Rubus discolor*) is a perennial in the Rosaceae. *Rubus* is native to western Europe. Thickets can produce 7,000 to 13,000 seeds per square meter. *Rubus* spreads vegetatively from canes and roots. It is a strong competitor and can replace native vegetation.

HBNWR Distribution: There are only a few occurrences within the Salmon Creek Unit, but some are along the road suggesting that it will spread further into the unit (Figure 12).

Control: Mechanical removal or burning are the most effective removal methods. Burning must be followed by digging up the root crown or by herbicide use. Planting fast-growing shrubs or trees may prevent the reestablishment of *Rubus*.

Dense-flowered cordgrass (*Spartina densiflora*) is a perennial in the Poaceae. Spartina is native to Chile and Argentina. It reproduces by seed and spreads vegetatively (Faber 2000).

HBNWR Distribution: *Spartina* was found to occur along the Hookton Slough Unit and a couple of places in the Salmon Creek Unit (Figure 13). Its limited distribution within the Salmon Creek Units suggests that control is possible. Further mapping is necessary to understand the distribution within the Hookton Slough Unit.

Control: There is a digging and mowing experiment currently underway at the Lanphere Dunes Unit. Results from this experiment will suggest control methods.

Fennel (*Foeniculum vulgare*) is a perennial in the Apiaceae. It is native to southern Europe and the Mediterranean region. Foeniculum reproduces from seeds and root crowns. It has prolific seed production, seed viability, and a long-lived seedbank.
Seed production can begin as early as May and continue through November (Klinger 2000).

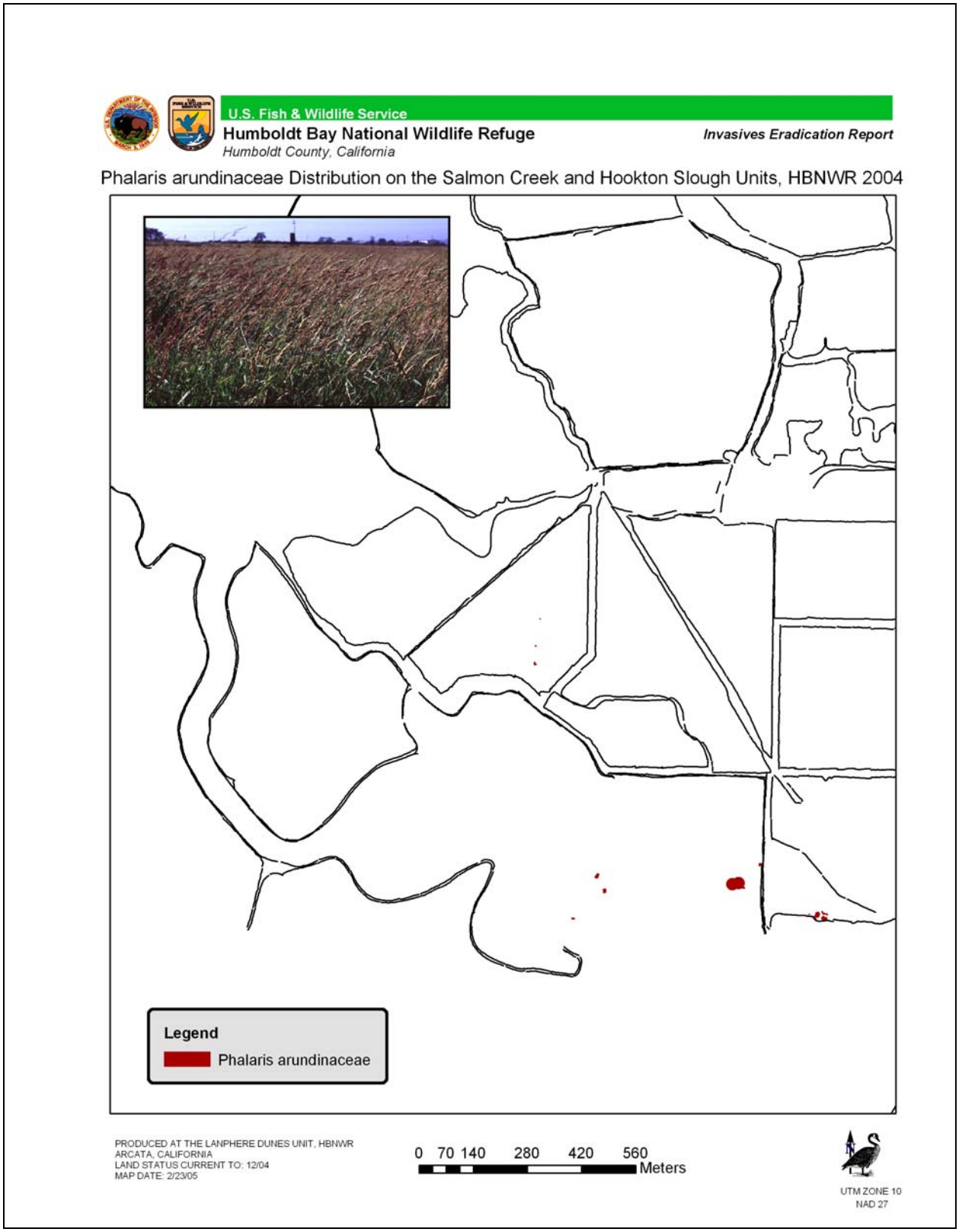


Figure 10. Occurrences of *Phalaris arundinaceae* at the Humboldt Bay NWR 2003-2004.

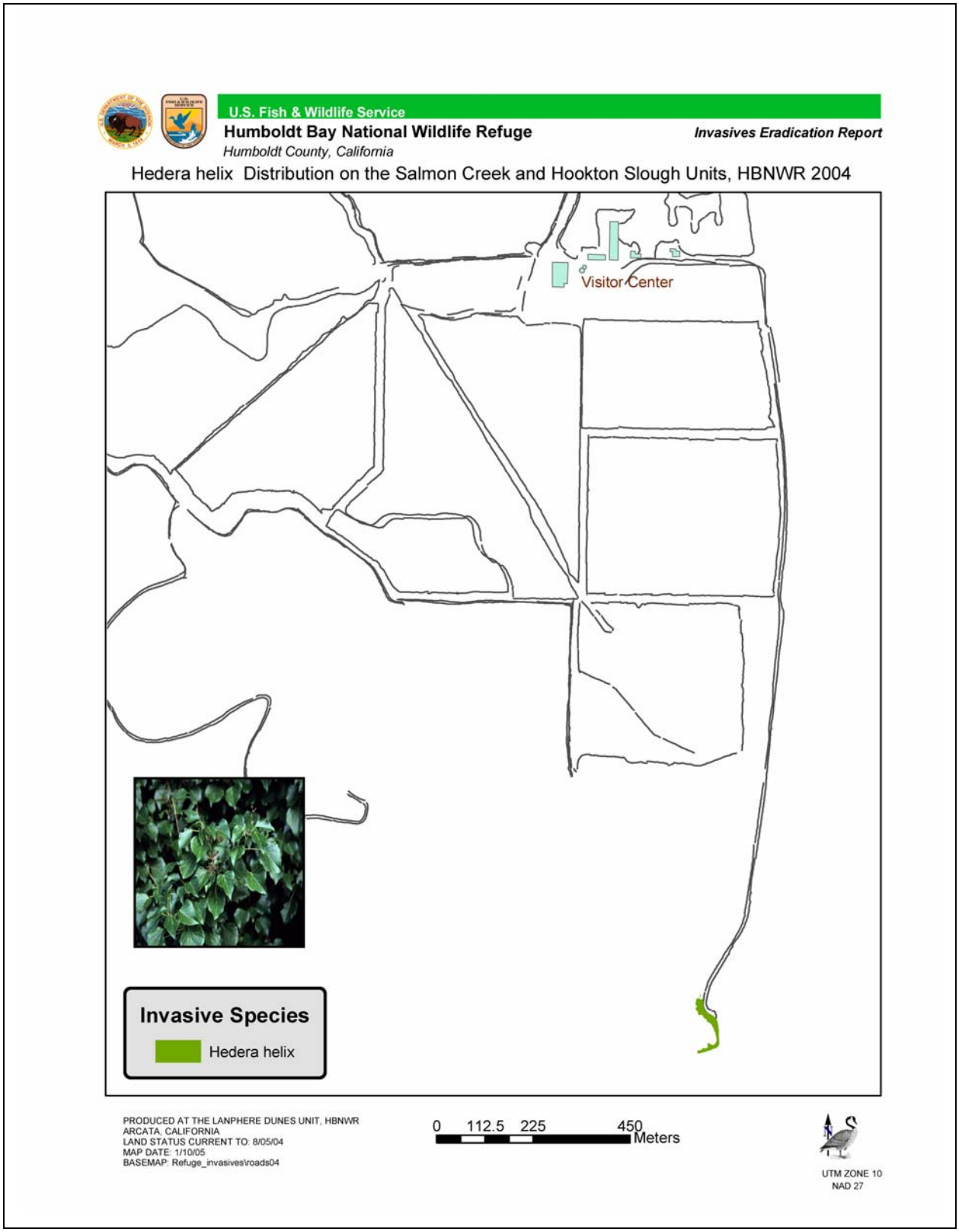


Figure 11. Occurrences of *Hedera helix* at the Humboldt Bay NWR 2003-2004.

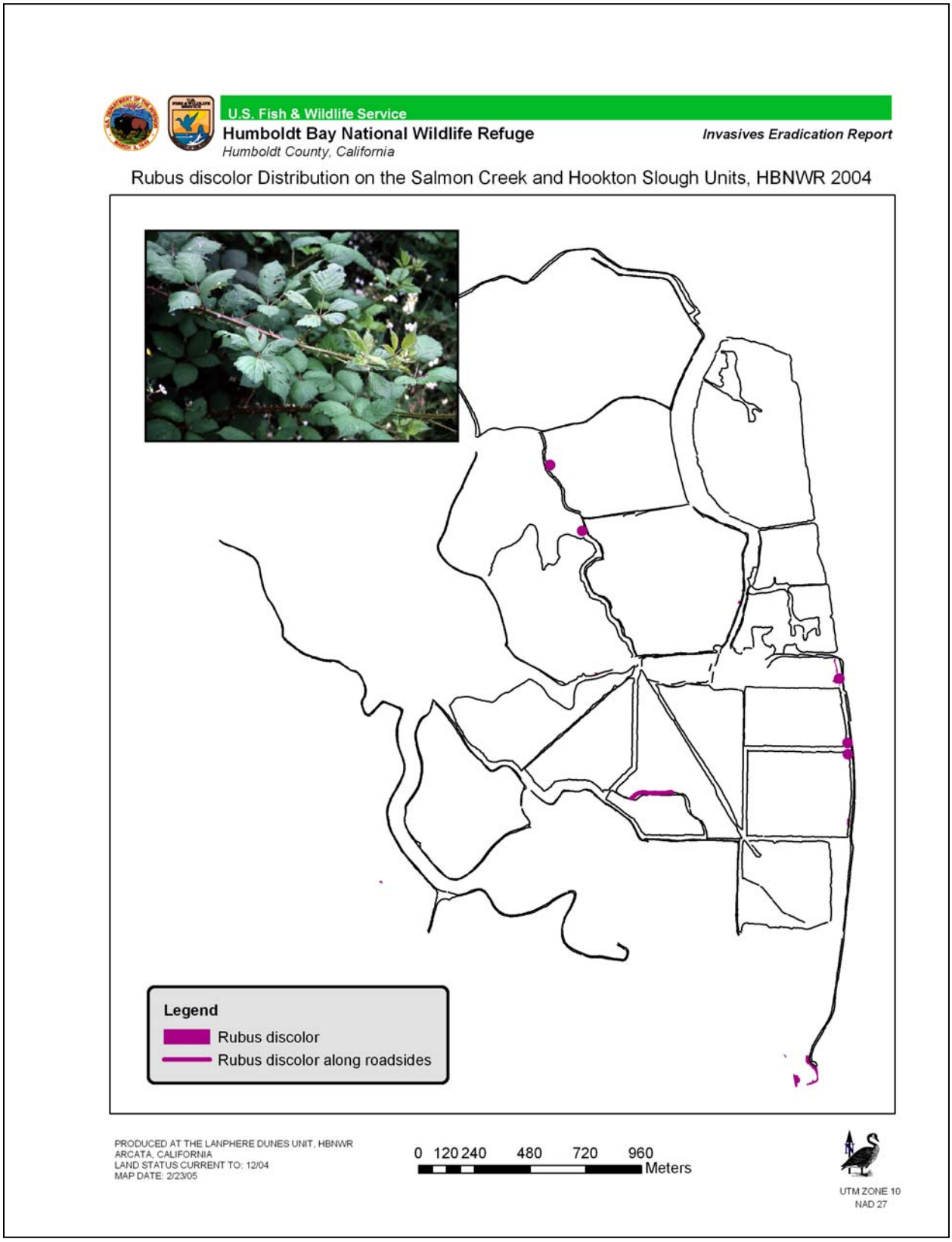


Figure 12. Occurrences of *Rubus discolor* at the Humboldt Bay NWR 2003-2004.

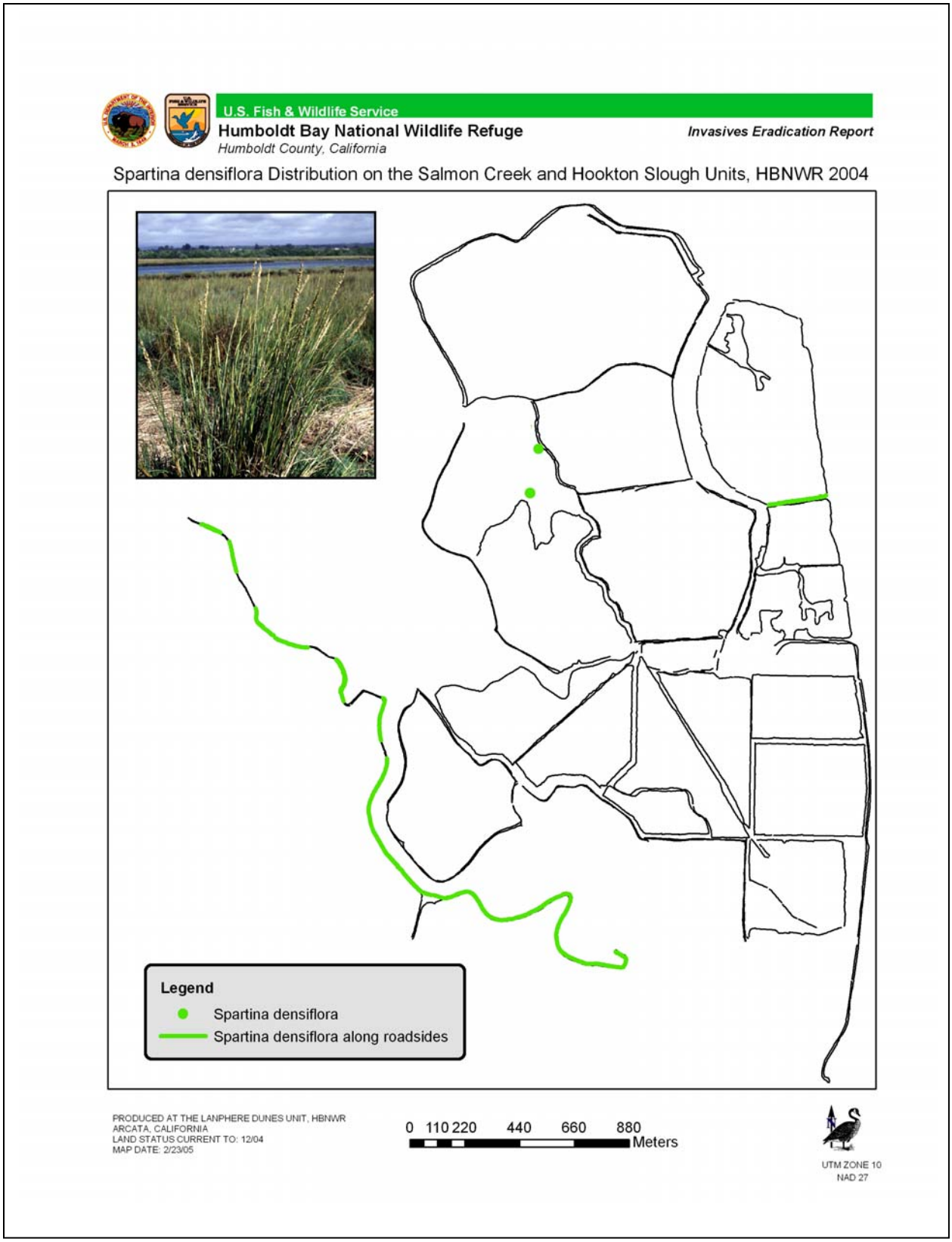


Figure 13. Occurrences of *Spartina densiflora* at the Humboldt Bay NWR 2003-2004.

HBNWR Distribution: *Foeniculum* was found along roadsides in the Salmon Creek and Hookton Slough Units (Figure 14).

Control: There is little published information on controlling fennel. Manual methods (hand-digging) are effective when infestations are light. Mowing or cutting are ineffective removal methods. Mowing can exhaust the resources of the taproots if mowing intervals are short.

Periwinkle (*Vinca major*) is a perennial vine in the Apocynaceae. *Vinca* originates from southern Europe and northern Africa. *Vinca* forms a dense ground cover preventing the growth and establishment of native species. It reproduces vegetatively.

HBNWR Distribution: *Vinca* was found in one location in the Salmon Creek Unit (Figure 15).

Control: Hand removal is effective if careful attention is paid to removing all root nodes and stolons (Drewitz 2000).

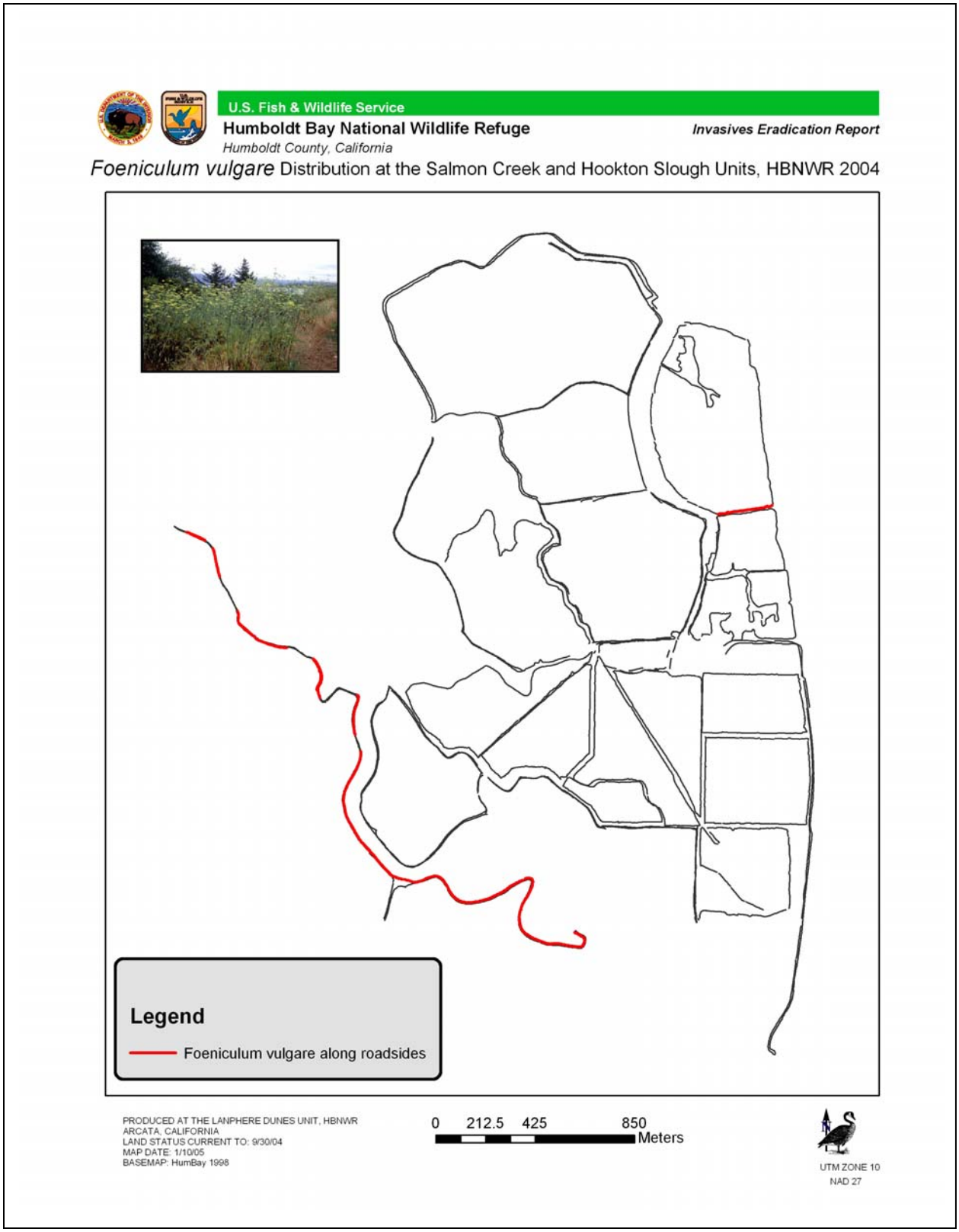


Figure 14. Occurrences of *Foeniculum vulgare* at the Humboldt Bay NWR 2003-2004.

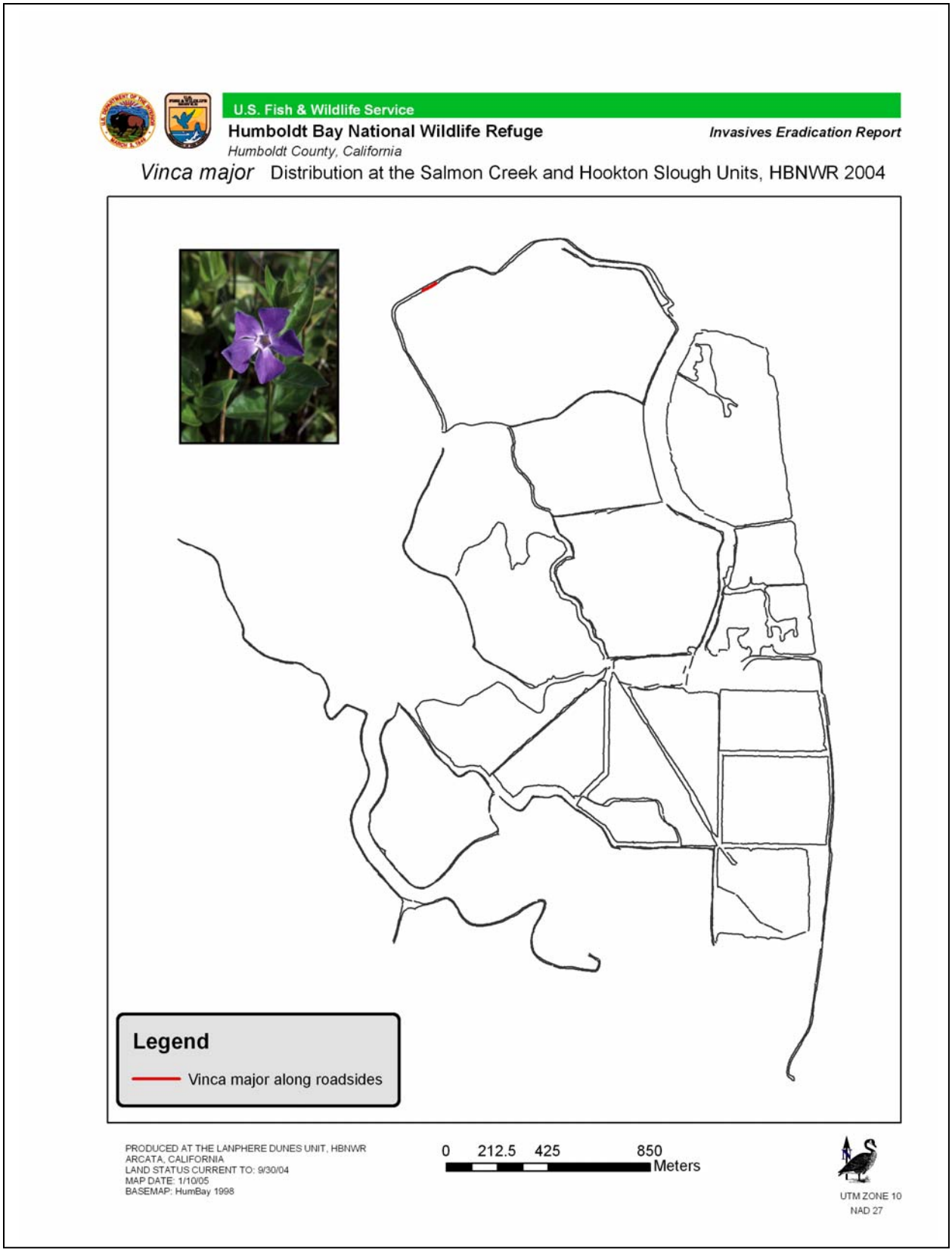


Figure 15. Occurrences of *Vinca major* at the Humboldt Bay NWR 2003-2004.

MAPPING ACCOMPLISHMENTS

In the 2004 mapping season 315 acres were surveyed for 24 invasive weeds. Eleven invasive species were mapped within the Salmon Creek and Hookton Slough Units and along the roadsides within both units Fifty-eight kilometers of roadsides were surveyed and mapped for invasives. Approximately 600 acres have been surveyed and mapped during the 2003-2004 seasons. Six hundred sixty-seven hours were spent by the volunteers during the training and mapping.

There are several subunits in the Salmon Creek Unit that were not mapped in the 2003-2004 season (Figure 16). Next season these areas should be mapped before mowing begins. Only a small portion of the Hookton Slough Unit was mapped due to time constraints. Mapping efforts should focus on this unit in the 2005 season.

INVASIVES CONTROL 2004

The refuge engineering equipment operators at HBNWR removed any known occurrences of *Phalaris arundinacea* (reed canary grass) and *Cortaderia jubata (*pampas grass*)*, both A listed species. Removal of unmapped occurences by the equipment operator were marked by hand on a map for data collection. Eight areas of *Phalaris arundinacea* and four areas of *Cortaderia jubata* were removed in 2004. Seventy one kilometers miles of roadsides were mowed as part of the ongoing management practice. Two hundred ten hours were spent by volunteers and the YCC removing weeds.

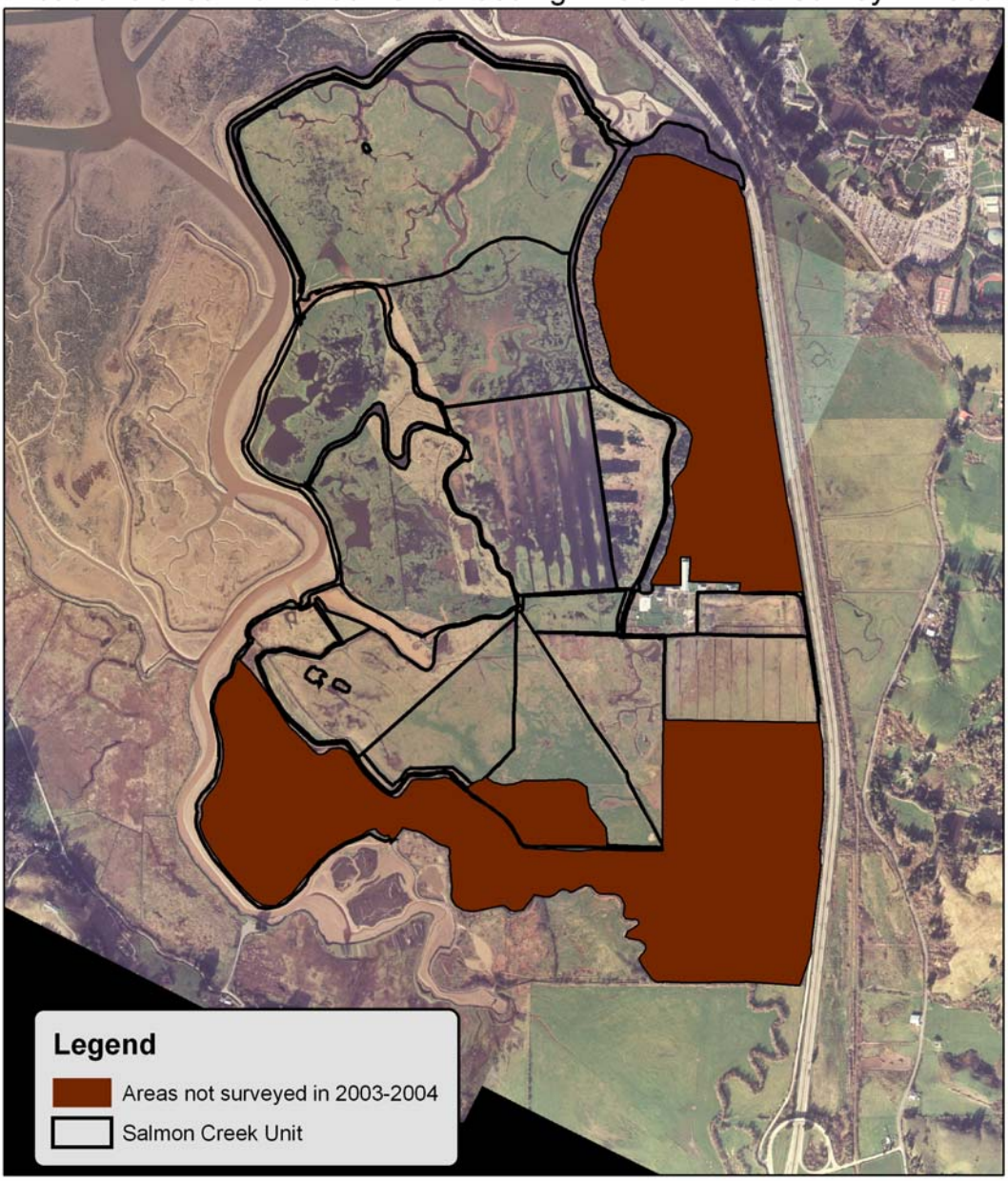
U.S. Fish & Wildlife Service

Humboldt Bay National Wildlife Refuge

Humboldt County, California

Invasives Eradication Report

Areas of the Salmon Creek Unit Needing Invasive Weed Survey in 2005



PRODUCED AT THE LANPHERE DUNES UNIT, HBNWR
ARCATA, CALIFORNIA
LAND STATUS CURRENT TO: 12/04
MAP DATE: 3/7/04
BASEMAP: HUMBAY 1998

0 115 230 460 690 Meters

UTM ZONE 10
NAD 27

Figure 16. Areas of the Salmon Creek Unit not surveyed in 2003-2004.

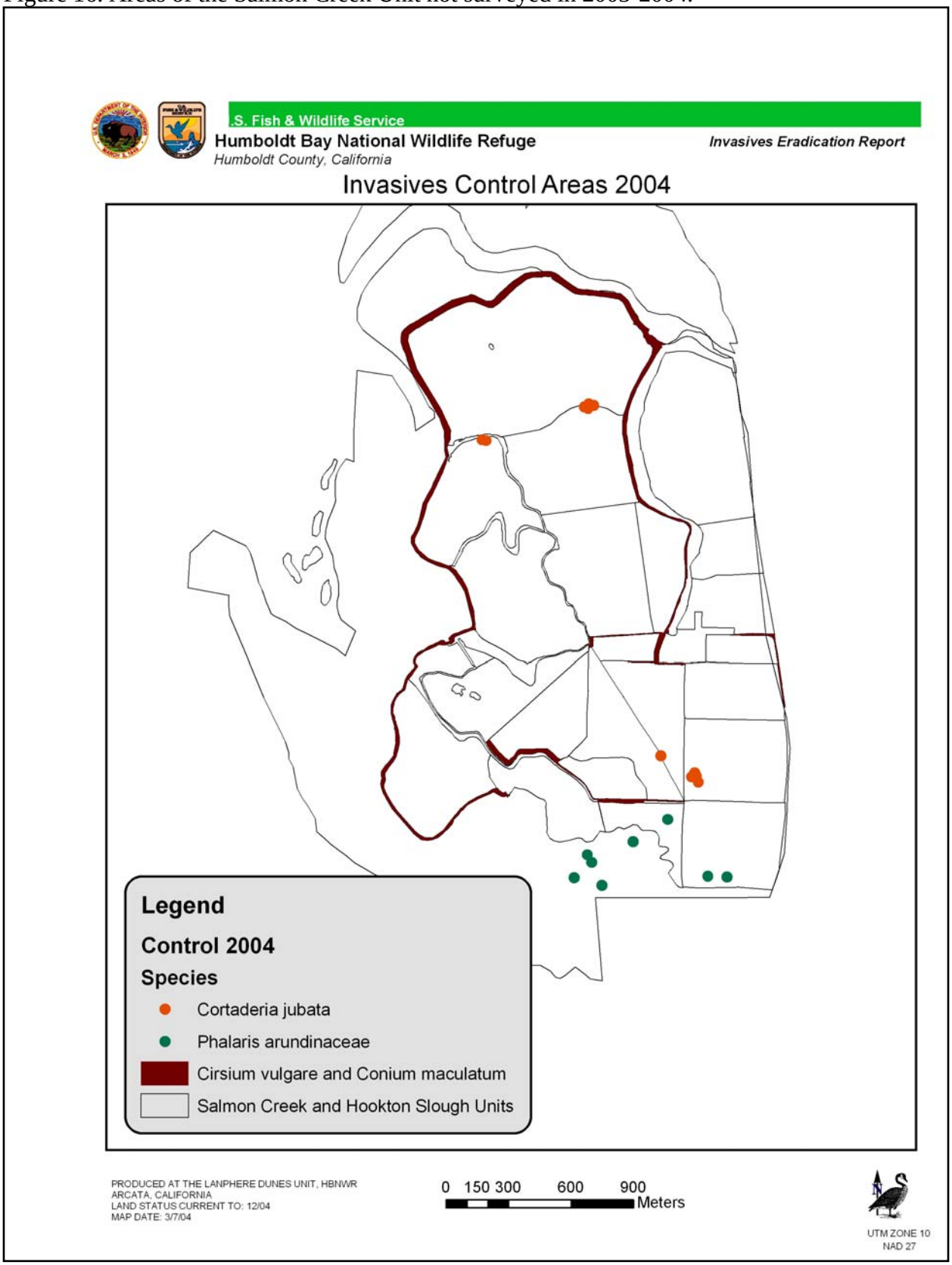


Figure 17. Distribution of invasives controlled in 2004.

Recommendations for Invasive Weed Control

1. Develop a Weed Management Plan.

   The Nature Conservancy has a template that is helpful when developing a comprehensive weed management plan. This template uses the adaptive management strategy for invasive species management. Adaptive management of invasive species requires that you:
   A. establish management goals and conservation targets for the site;
   B. determine which, if any, species or infestations threaten or have the potential to threaten your management goals and targets- those that do are" weeds";
   C. determine which methods are available to control the weeds;
   D. develop and implement a weed management plan designed to move conditions toward the management goals and to abate threats to your targets;
   E. monitor and assess the impacts of the weed management actions in terms of the management goals and target protection;
   F. start the cycle over again by re-evaluating conclusions made in steps A-d and modifying where necessary.
   This template is included as Appendix 3. Completed weed management plans for Cosumnes River Preserve and Cox Island Preserve are also included as examples (Appendix 4 and 5).

2. Focus eradication efforts on the incipient populations of highly invasive species.

   Management goals and conservation targets for the site have not been established. However, the following recommendations are based upon the 2003 and 2004 mapping season and the priority setting process suggested by TNC (Tu and Meyers-Rice 2001). Species are grouped according to the highest priority for management.
   A. *Echinochloa crus-galli*, *Phalaris arundinaceae*, *Cortaderia jubata*, *Cytisus scoparius*, and *Hedera helix* all have only a few occurrences and small populations. They are highly invasive, yet are at early stages of their invasions. They are all candidates for early detection, rapid response management techniques. Successful eradication of these species is possible and highly recommended.
   B. *Foeniculum vulgare*, *Rubus discolor*, *Conium maculatum*, and *Cirsium arvense* all have a limited number of occurrences. Many of their populations are along roadsides and are spreading towards the Salmon Creek Unit. Control of these species may become difficult if the populations continue to grow and spread. Efforts to control further spread into the Salmon Creek Unit this year will help to eradicate these species.
   C. *Spartina densiflora* has limited occurrences within the Salmon Creek and Hookton Slough Units. Because this species has invaded many areas of Humboldt Bay, eradication is highly improbable. However, controlling the spread of *Spartina* into the refuge is possible. *Cirsium vulgare* occurs throughout the Salmon Creek Unit and along roadsides.

Control and eventual eradication of this species will require the development of a strategy to limit further spread and integrate control methods.

3. Integrate control methods.
   Control methods for each species are included in Appendix 1. A timeline for each species removal is included (Figure 16). My recommendations do not include the use of herbicides. However, in some cases the combination of manual removal and an herbicide application may be the most effective control method.

4. Continually monitor to prevent reinfestations.

5. Incorporate the WIMS database into the inventory and mapping of invasives on the refuge.

6. Include B and C rated weeds in 2006 mapping efforts.

7. Tie roadside mowing to the control efforts of the dominant invasives along roadsides and in fields. Several of the invasives can be controlled by mowing. Timing their control efforts with road maintenance can reduce their spread into uninvaded areas.

8. Vehicles can disperse invasives along roadsides and throughout fields. There are several important precautions that can help to reduce the spread of invasives by vehicles.
   A). Perform road maintenance from uninfested to infested areas.
   B). Wash equipment immediately after working in an infested area, clean off all dirt and plant parts
   C).Standardize cleaning methods and require all contractors, researchers, and volunteers adhere to the standards.
   There is a U.S. Forest Service road maintenance and weed management report attached in Appendix 5.

Management Schedule 2005

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Echinochloa hand-pulling												
Cirsium arvense hand-pulling												
Cirsium vulgare *mowing*												
Cytisus hand-pulling												
Cortaderia hand-pulling												
Phalaris mechanical												
Hedera hand-pulling												
Rubus mechanical or burning												
Conium hand-pulling or mowing			Hand-pulling/Mowing					Second Mowing				
Spartina												
Foeniculum *hand-pulling*			Hand-pulling									
Vinca *hand-pulling*						Hand-pulling						

Figure 18. Timeline for species control.

VOLUNTEER RECRUITMENT AND TRAINING

1. RECRUITMENT

Volunteers were solicited by posting a notice at Humboldt State University's Career Center (Appendix 5). Volunteers were offered training in the use of a PDA/GPS unit, ArcPad software, and a stipend of up to $500 for time spent on the project. Interested parties were asked to submit a resume. Ten Humboldt State University students applied for the project. Applicants were interviewed over the phone and chosen based on their availability, plant identification skills, and GPS/GIS skills. Three volunteers were chosen for the project because of PDA availability.

2. TRAINING METHODS

<u>Day 1- June 29, 2004 (9am – 4pm)</u>

1. Introduction to the project and HBNWR
2. Filled out Volunteer Service Agreements and appropriate paperwork in order to receive stipends.
3. Overview of materials in training packets
4. Hands-on overview of how to use PDA/GPS units
5. Practice with PDA/GPS units in the field
6. Overview of plant identification of all A1 and A2 species
7. Tour of the Salmon Creek Unit
9. Went over cover estimation using a computer simulation program called DISEASE.

<u>Day 2 – July 1, 2004 (9am -4pm)</u>

1. Hands-on review of how to use PDA/GPS units
2. Introduction and practice of road mapping methods in the field, including practice of plant identification and cover class.
3. Volunteers and FOD consultant worked in pairs while mapping roads. The consultant worked with each individual at least once to make sure they were able to correctly gather and enter data.
4. Observation of the mechanical removal of reed canary grass (*Phalaris arundinacea)*
5. Hand removal and mapping of reed canary grass (*Phalaris arundinacea)* in area inaccessible with heavy equipment.
6. Went over how to download information from the PDA's onto a computer and viewed the data gathered in the field that day.

<u>Day 3 – July 27, 2004 (9:30am – 11:30am)</u>

1. Introduction and practice of mapping subunits using tracklogs, points, and polygons.

MAPPING METHODS

Mapping of the category A and D species were carried out in two phases. In phase 1 volunteers mapped all A and D category species located along the roads of the entire Salmon Creek Unit. Volunteers created line shapefiles along the roadsides, each measuring approximately 50 meters in length and 5 meters wide. The lines were later buffered in ArcMap to produce polygon features. Within each polygon, Daubenmire cover classes were noted for each A1, A2 and D plant species.

In phase two, all A1 and A2 and D plant species located within unmapped subunits of the Salmon Creek Unit were mapped. Each subunit is traversed in a zig-zag pattern with volunteers examining 3-5 meters on either side of the line they are walking. GPS units are used to track the survey area to avoid missing or duplicating an area. All occurrences are mapped as points or polygons as appropriate. Areas smaller than 5 m^2 are mapped as a point and the number of plants are recorded.

Shapefiles from individual PDA/GPS units were imported into ArcMap. All shapefiles for a species were merged into one shapefiles. The roads shapefiles were merged into one shapefile. The attribute tables of all final shapefiles were populated with data to meet the NAWMA standards.

This project uses the North American Invasive Plant Mapping Standards developed by the North American Weed Management Association. These standards are endorsed by the U.S Fish and Wildlife Service. These standards are intended to be the minimum standards for weed inventories and address the basic information necessary to compare invasive species problems across tribal, county, state, national and international borders (NAWMA 2002).

STAFF TRAINING

One staff and one contractor attended the Weed Information Management System (WIMS) training, by The Nature Conservancy and the U.S. Fish and Wildlife Service in October, 2004. This database system is integrated with ArcPad in the PDA/GPS units. WIMS allows data on species occurrence, assessment, and treatment to be collected in the field. The data can be exported into a GIS file format for use in maps. This inventory meets the NAWMA standards and is easily shared with other users.

VOLUNTEER ACCOMPLISHMENTS

The volunteers were capable of mapping in the field alone with successful data collection. One volunteer assisted in the organization of collected data into ArcView GIS. All three volunteers were very eager and quick to learn the skills needed for this project. Volunteers were asked at the end of each day of training what worked for them and where improvements could be made. They all agreed that the pace of the training and amount of information was appropriate. The volunteers were mapping roadsides comfortably on their own halfway through the second day of training.

The volunteers felt comfortable working with the PDA's and with each other to work out any problems they might be incurring. It is believed that because each volunteer was a Humboldt State University student looking for summer internship experience, they were dedicated to learning and following through with the training they received. The stipend they received was a good incentive to continue the project throughout the summer. During last year's pilot project, most of the volunteers stopped participating after receiving their training.

TRAINING RECOMMENDATIONS FOR the 2005 SEASON

VOLUNTEER RECRUITMENT
Funding in 2005 will enable this project to continue and expand. We highly recommend recruiting Humboldt State University students, and offering them a stipend. This project would be improved by starting the recruiting, training, and mapping in May or early June. This would allow the volunteers to map more areas and implement control methods.

VOLUNTEER TRAINING
The current methodology of training was effective. The volunteers were familiar with computers and GPS/GIS technology. This improved their rate of learning and comprehension of the mapping techniques. Methodology to check the mapping data needs to be improved as some files were missing data. Communication methods between the volunteers and Lanphere staff could be improved. The Photographic Guide to Humboldt Bay Dunes and Wetlands should be included on the PDA's for plant identification. It would be helpful to train volunteers using a PDA that is connected to a projector.

STAFF TRAINING
The WIMS database will be incorporated into this project in 2005. A staff member located at the refuge headquarters should to be trained in the use of WIMS, the PDA/GPS unit, and ArcMap. This will enable field data to be accurately entered into the GIS efficiently and checked by a refuge staff member.

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Appendix 5. Information submitted to campus on-line employment board

The U.S. Fish and Wildlife Service (USFWS) and Friends of the Dunes (FOD) are partnering on an exciting project. We will be using PDA/GPS units to map invasive plant species at the Humboldt Bay National Wildlife Refuge. With this information we will prioritize and strategize removal of invasive plants at the refuge.

USFWS and FOD are looking for stipend volunteers to help this summer.
Training will be provided.

Start Date June 21st
End Date August 19th

2 days a week, 8hr days

Contact Emily Walter at 444-1397 for further information.
Mail resumes to: Friends of the Dunes
P.O. Box 186
Arcata, CA 95518

United States Department of the Interior
FISH AND WILDLIFE SERVICE

Humboldt Bay National Wildlife Refuge Complex
1020 Ranch Road
P.O. Box 576
Loleta, CA 95551
Phone (707) 733-5406 / Fax (707) 733-1946

DATE: June 29, 2004

INVASIVE WEED MAPPING INTERNSHIP

DATES
June 29, 2004 – August 31, 2004

RESPONSIBILITIES
Interns will use PDA/GPS units to map invasive plant species at the Humboldt Bay National Wildlife Refuge (primarily the Salmon Creek Unit). Approximately 90% of duties will be walking outdoors while mapping specific invasive plants. Approximately 5% of duties will be indoors, downloading collected information onto computers and filling out paperwork. Approximately 5% of duties will be invasive plant removal. All training for this project will be provided.

STIPEND
A full workday will consist of seven hours of work and one hour for travel, equaling eight hours. A stipend of $30/day will be given for an eight-hour day as described. Interns will work 2-3 days each week, not exceeding 25 days. There will be a review to evaluate if there will be continued funding after 25 days. Interns are responsible for submitting their own invoice every two weeks in order to receive payment.

TERMINATION
This Agreement may be terminated by mutual agreement or by either party provided at least five working days notice is given.

_____ Date:
(Signature of Individual)

_____ Date:
(Signature of Coordinator or Supervisor)