

## **Short-Term Management and Restoration Plan Summary**

The Nature Conservancy's (TNC) Sacramento River Project is a public/private partnership focusing on the protection and restoration of riparian and aquatic habitats along the Sacramento River's main-stem within the Conservation Area, as defined by the Upper Sacramento River Fisheries and Riparian Management Program (SB-1086). Many of the Project objectives are derived from the SB-1086 process which represents a decade of bringing together private and public partners to coordinate and facilitate management of the Sacramento River, with the overall goal of preserving remaining riparian habitat and reestablishing a continuous riparian ecosystem along the Sacramento River. The Project partners' work supports the larger vision of this program to reconnect the river to its floodplain, allow the river to meander, and restore and protect riparian habitat while, at the same time, improving the economic sustainability of farming within the Inner River Zone.

In 1991, with the establishment of the Sacramento River National Wildlife Refuge (SRNWR), TNC and U.S. Fish & Wildlife Service (USFWS) began working together to protect and restore habitats for riparian and aquatic wildlife species. TNC assists USFWS with land acquisitions to complete the SRNWR, and manages the agricultural portions of these properties under a Cooperative Land Management Agreement. These agricultural properties are leased to local farmers, with a percentage of the income used to fund riparian forest restoration on the SRNWR. These properties are in flood-prone areas, ideal for riparian forest, and typically difficult to farm. When it is no longer economically viable to farm a given site, the land is removed from the agriculture program and restoration commences. Farming lessees will often plant riparian forest under contract. Once complete, the SRNWR is anticipated to protect and restore 18,000 acres of riparian forest and associated habitats along the river's main channel.

TNC is developing adaptive management plans for the operation of its agricultural and natural areas along the Sacramento River. These plans will help ensure that TNC meets its management goals: to be good environmental stewards, be a good neighbor to adjacent farmers, and create an environment that will benefit the local economy, improving water quality, recreation and scenic values. Furthermore, farming is an important asset for protecting wildlife habitat from urban encroachment. Ultimately, the goal of each farm management plan is to guide the transition from agricultural production to restoration for each property. The key to a successful restoration is weed control, these plans aim to control weeds while the property is in agricultural production so that weeds are well under control when restoration is initiated.

Following the plan summaries for the individual properties, we introduce the short-term research and monitoring activities that are proposed to take place at these sites. These activities represent a combination of routine short-term investigations to track the performance of planted species, surveys conducted to track community development, and experimentation which seeks to improve restoration techniques.

The final section presents methodological details on how detailed site assessments are performed. These assessments expand upon the coarse-scale investigations that were completed for all of the 97-NO2 properties during the baseline assessment phase. Detailed site assessments provide a fine-scale characterization of current site conditions, information that is helpful in devising restoration management activities.

## 1. Gunnhill

### **Property Description**

The Nature Conservancy currently owns the Gunnhill Property, which has been in older producing walnuts for 40 years. Erosion reduced much of the property until the U S Army Corps of Engineers placed riprap along the northern side of the property in 1986 stabilizing the erosion. There is a small strip of remnant riparian habitat along the river, but most of the property is in agricultural production. TNC will continue to farm this property until the site of the new J Levee is determined.

The land is the future site of the new “J Levee,” a project of the United State Army Corps of Engineers. Also involved is the California Department of Water Resources. The existing J Levee runs between the Sacramento River and Hamilton City, in Glenn County. The new levee will be wider and longer, but its exact location has not yet been determined.

There is a small patch of Tree of Heaven (*Ailanthus altissima*) near the northwest corner that should be removed before it spreads to other natural areas in the vicinity. The orchard has a lot of Bermuda grass, but in this case the thick sod is needed to prevent scouring during high water. It is not uncommon for the river to deposit up to a foot of sand at the site.

**Salient Facts: Gunnhill**

<b>Address of Property</b>	County Road 23, South of Hamilton City
<b>Property Location</b>	South of Hamilton City on Jenny Lind Bend, between Hwy 45 and the Sacramento River (West side of river)
<b>Gate Combination</b>	N/A
<b>River Mile</b>	198-197
<b>Acreage</b>	Total: 63 (Walnuts-54, Other-9)
<b>Ownership</b>	The Nature Conservancy
<b>Assessors Parcel Number</b>	032-270-008
<b>Township/Section/Range</b>	22N R1W 28, 27
<b>County Pesticide Use Permit</b>	11-02-0403614
<b>Zoning/Land Use/Soil Type</b>	Agricultural
<b>Market Value at Purchase</b>	\$459,199
<b>Date of Purchase</b>	April 5, 2000
<b>Seller</b>	Gunnhill Properties
<b>Lessee</b>	Pia Sevelius
<b>Address</b>	4416 Ord Ferry Road, Chico, CA 95928
<b>Phone Numbers</b>	530-898-3436
<b>Management/Staff</b>	Greg Wheeler 530-342-6935 office, 530-520-1235 cell
<b>Term of Lease</b>	October 31, 2003
<b>Crop/Varieties</b>	Walnuts: Hartleys, Franquettes
<b>PCA</b>	Scientific Methods, 894-5857
<b>Named Waterbodies/Sloughs</b>	Sacramento River,
<b>Restored Plant Communities</b>	None
<b>Endangered Species Present</b>	Unknown
<b>Threatened Species Present</b>	Unknown
<b>Ecological Sites of Concern</b>	River bank
<b>Improvements</b>	Levees

<b>Wells</b>	One
<b>Pumps</b>	1 - 40 HP pumps. Serial number: HR 102 3824
<b>Chattel</b>	None (Gunnhill owns the irrigation pipe)

### **Historical and Existing Conditions**

Prior to the planting of walnuts, the property was farmed to field crops. In 1965, 55 acres of walnuts were planted here, mostly Hartleys on Black Walnut stock. There are a few Franquettes for pollinators. In the years 1987-1998, the farmer replanted missing trees on Paradox rootstock.

The Nature Conservancy has purchased the property to assist Hamilton City in the development of a new 'J Levee'. The value of the land in Hamilton City isn't enough to justify US Army Corp of Engineers to create a levee to protect the city, but with the value of habitat restoration funding it may be possible to fund the project. Fifty percent of USACOE projects are paid for by the federal government, 25 percent is paid by the state and 25 percent by local match.

### Wildlife

The property is bordered on the east side by 300 acres of Department of Fish and Game (DFG) property. There is an abundance of wildlife in the area and along the river.

### Infrastructure

This property is very susceptible to flooding, and floods often. There are two levees in the area, which have been maintained by several of the neighboring property owners. The water usually does not spill over the levees, although it did during extreme flood events. There is a long levee on the Vereschagin property that is being undermined by ground squirrel burrows. Riprap was installed along the river in the 1980's. The pump and well are located outside of the property on an easement and the irrigation water is piped by a mainline to the orchard.

### **Neighboring Habitat Characterizations and Ownership**

#### North

Sacramento River

Across river: USFWS Pine Creek Unit

#### East

Sacramento River, DFG

Across river: USFWS Pine Creek Unit

Scotty's Landing on Pine Creek

#### South

TNC, walnuts, Ken Kaplan lease.

TNC, alfalfa, Mike Millar lease.

#### West

TNC, prunes, Vereschagin lease.

Communities within two miles:

Hamilton City  
 Scotty's Landing

**Gunnhill Short-Term Management Plan**Goals and Objectives

Continue with agricultural lease until farming is no longer profitable, then remove the orchard and begin the restoration.

Crop Production

2000 - 329,116 in shell lbs.  
 2001 - 283,848 in shell lbs.  
 2002 – 92,230 in shell lbs.

Income

2000 - 10%. \$4,964  
 2001 - 10%. \$3,051  
 2002 – 10%. \$2,794

Farming Schedule

Winter: Prune dead limbs and burn in open areas.

Spring. Control walnut blight before rains with USFWS approved materials. Use trap counts to monitor for codling moth and treat when necessary to avoid losses. Irrigate if necessary to maintain optimum tree health. Cut and burn dead trees. Control weeds by mowing in rows and by contact herbicides in tree rows.

Summer. Control codling moth, mites, aphids, and walnut husk fly with an approved method. Irrigate orchard regularly. Control weeds as needed to keep trunks clean.

Fall. Harvest promptly for the best yield and quality. Dry and market walnut crop.

Orchard pests

walnut blight (*Xanthomonas campestris var juglandis*)  
 codling moth (*Laspeyresia pomonella*)  
 walnut husk fly (*Rhagoletis completa*)  
 ground squirrels (*Otospermophilus beechyi*)

Non-native Vegetation

The orchard floor is composed mainly of Bermuda grass (*Cyanodon dactylon*) as well as a few annual grasses and summer annual grasses. There is also a small patch of Tree of Heaven (*Ailanthus altissima*) along the river near the beehive yard.

#### Native Vegetation

Although it is a thin strip of unfarmed land, there are a few natives along the river: blue wild rye (*Elymus glaucus*), California blackberry (*Rubus ursinus*), California wild grape (*Vitis californica*), creeping wild rye (*Leymus triticoides*), mugwort (*Artemisia douglasiana*), Santa Barbara sedge (*Carex barbarae*), box elder (*Acer negundo* var. *californicum*), cottonwood (*Populus fremontii*), valley oak (*Quercus lobata*), and willows (*Salix* spp.)

#### Special Areas of Concern

Riprap has been installed along the riverbank at this property. The integrity of the levee system located on this property is of concern and will be maintained and improved.

### **Gunnhill Restoration Plan**

#### Goals and Objectives

No funds are currently allocated for restoration. However, the Chico Landing Subreach hydrologic study determined that the 63-acre orchard is appropriate to be planted to a savanna riparian community.

#### Detailed Site Assessment

To be completed when restoration funds are available.

#### Vertebrate Pests

Ground squirrels are undermining the levee to the west between the property and the large Vereschagin prune block. They will be controlled regularly. Currently the neighbor is using the Rodex machine to collapse the burrow system and reduce the populations.

#### Weed Control Program

Weeds will be controlled during the final phase of the farming operations. The weeds on the inside of the levee will be controlled to provide access and exposure of squirrel activity.

#### Orchard

This orchard has 2 to 3 more viable years before it will need to be removed.

### **Issues**

#### Flooding

The orchard floods, but it is not eroding. The farm manager stated that when the river floods, the water just goes right through the property and does not sit. The river has been as high as the top of the levee in the past.

#### Trespassing/Litter

There is a significant trespassing problem for the farm manager because the orchard is used to access the river or the adjacent DFG property. People run over the movable pipe at the rate of about 30 to 50 pipes per year. Working with all of landowners, we hope to provide greater security to the properties and equipment in the area in 2003.

### **Adaptive Management Checklist**

#### Research and Monitoring

There is no planned research or monitoring at this site, but some may be initiated as the Hamilton City J Levee program develops.

## 2. RX Ranch

### Property Description

The RX ranch is currently owned and managed by The Nature Conservancy. After restoration it will be turned over to The California Department of Fish and Game, which owns the property on two sides. There are several blocks of almonds and walnuts on the property. From the west edge of the property, there is a young, prime producing block of almonds, then an older almond orchard that has considerable missing trees. Next to the old almonds is a very young block of walnuts and next to the river a small abandoned block of walnuts.

TNC is scheduled to begin restoration on the RX Ranch in 2003 with pending CALFED restoration funding. The 2003 season will be the last year of agricultural production if funding is secured.

Jenny Lind Bend and Slough is located on the northeast side of the property adjacent to the California Department of Fish and Game. The main concern with the non-farmed areas on this property is to prevent the spread of the Tree of Heaven (*Ailanthus altissima*) to the rest of the land and surrounding natural areas. The other concern is controlling the extensive Bermuda grass (*Cyanodon dactylon*) which has developed as an understory in the young walnut orchard.

**Salient Facts: RX Ranch**

<b>Address of Property</b>	County Rd 23
<b>Property Location</b>	Two miles south of Hamilton City, between the Sacramento River and Hwy 45 on Rd 23.
<b>River Mile</b>	194-194.5
<b>Acreage</b>	Total-261 (Almonds-152, Walnuts-91)
<b>Ownership</b>	TNC
<b>Assessors Parcel Number</b>	032-300-005
<b>Township/Section/Range</b>	21N, 1W Section
<b>County Pesticide Use Permit</b>	04-02-0408818
<b>Zoning/Land Use/Soil Type</b>	AE-40 Exclusive Ag/Flood Zone A/70% Columbia Silt Loam
<b>Market Value at Purchase</b>	\$1,500,000
<b>Date of Purchase</b>	February 25, 2000
<b>Seller</b>	Ted Dress, et. al.
<b>Lessee</b>	Paiva Farms, Inc.
<b>Address</b>	13522 Hamilton Nord Cana Hwy, Chico, CA 95973
<b>Phone Numbers</b>	530-345-8491 Office, 530-345-1485 fax, 520-4213
<b>Office</b>	Dan Paiva, Julie Small, Guillermo.
<b>Term of Lease</b>	Ends Dec. 31, 2003
<b>Crop/Varieties</b>	Walnuts: Chandlers and Franquettes. Almonds-Nonpareil, Peerless, Carmel, Butte, Mission
<b>PCA</b>	Hans Gabski, Gabski Crop Consulting, 530-518-8985m
<b>Named Waterbodies/Sloughs</b>	Jenny Lind Slough, Sacramento River
<b>Restored Plant Communities</b>	None
<b>Endangered Species Present</b>	Unknown-possible VELB, Giant Garter Snake
<b>Threatened Species Present</b>	Unknown
<b>Ecological Sites of Concern</b>	Jenny Lind Slough
<b>Improvements</b>	Levee to the North, built in 1995
<b>Wells</b>	Seven
<b>Pumps</b>	Yes

**Chattel**

Pumps, raised fuel tank at old huller site

**Historical and Existing Conditions**Farm

By 1955 most of the east side of the property had already been cleared and was being farmed to row and field crops. However the western side of the property was still in valley oak woodland forest.

The older almonds were planted in 1980, but the majority of the almonds and the walnuts were planted between 1993 and 1994. All of the new orchards are in prime production, but the older almond orchard has had considerable loss to flooding and winds. There is a solid set irrigation system throughout property for irrigation.

Wildlife

The property is bordered on the northeast side by 300 acres of DFG property. There is an abundance of wildlife in the area and along the river.

Infrastructure

A huller shed built in 1981 and converted to a shop, which has since been removed. A levee was built to north after the 1995 floods.

**Neighboring Habitat Characterizations and Ownership**

North: Jenny Lind Slough, California Department of Fish and Game.

East: California Department of Fish and Game State of California, river and riparian

South: USFWS- Capay Unit; corn, sunflower, wheat.

West: TNC, Plaza Farms lease; walnuts.

Community members within two miles:

Hamilton City

Scotty's Landing

**RX Ranch Short-Term Management Plan**Goals and Objectives

To farm the property until restoration funds become available or the orchards are no longer viable.

Crop Production

2000 - 190,541 lbs total (walnuts and almonds)

2001 - 469, 152 lbs total (walnuts and almonds)

2002 – n/a

Income:

2000 - \$22,369

2001 - \$24,679

2002 – n/a

2003 Farming Schedule

## Walnuts

- Winter: Prune dead limbs, burn in orchard or open area.
- Spring: Control walnut blight before rains with DPR approved fungicides. Use trap counts to monitor for codling moth and treat when necessary to avoid losses. Irrigate if necessary to maintain optimum tree health. Cut and burn dead trees. Control weeds by mowing in rows and by contact herbicides in tree rows.
- Summer: Control codling moth, mites, aphids, and walnut husk fly with an approved method. Irrigate orchard regularly. Control weeds as need to keep trunks clean.
- Fall: Harvest promptly for the best yield and quality. Dry and market walnut crop.

## Almonds:

- Winter: Prune dead limbs, burn in orchard or open area.
- Spring: Control blossom brown rot and shot hole with approved DPR fungicides. Irrigate if necessary to maintain optimum tree health. Cut and burn dead trees. Control weeds by mowing in rows and by contact herbicides in tree rows.
- Summer: Control navel orangeworm, peach twig borer, and mites. Irrigate orchard regularly. Control weeds as need to keep trunks clean.
- Fall: harvest promptly for the best yield and quality. Dry and market almond crop.

Orchard pests

## Walnuts:

walnut blight (*Xanthomonas campestris var juglandis*)codling moth (*Laspeyresia pomonella*)mites (*Tetranychus spp.*)navel orangeworm (*Amyelois transitella*)walnut husk fly (*Rhagoletis completa*)ground squirrels (*Otospermophilus beechyi*)

## Almonds:

blossom brown rot (*Monilinia laxa*)shot hole (*Stigmia carpophila*)navel orangeworm (*Amyelois transitella*)peach twig borer (*Anarsia lineatella*)

mites (*Tetranychus spp.*)  
ground squirrels (*Otospermophilus beechyi*)

#### Non-native Vegetation

Tree of Heaven (*Ailanthus spp.*) was found along the Jenny Lind Slough, both between the road and the slough, and between the abandoned orchard and the slough. Some of the larger trees are covered in grape vines. These trees should be removed in the summer of 2003 before they become even more widespread.

#### Native Vegetation

These native species can be found along the slough: creeping wild rye (*Leymus triticoides*), mugwort (*Artemisia douglasiana*), California blackberry (*Rubus ursinus*), California wild grape (*Vitis californica*), box elder (*Acer negundo var. californicum*), cottonwood (*Populus fremontii*), Valley oak (*Quercus lobata*), and willows (*Salix spp.*).

#### Special Areas of Concern

Contamination of Jenny Lind Slough with agricultural runoff is a concern at this site. Additionally tail water in the drainage ditch between the property and Road 23 should be inspected further to assure that there isn't any discharge of agricultural contaminants.

### **RX Ranch Restoration Plan**

#### Goals and Objectives

The unit was included in a proposal submitted to the 2001 CALFED ERP request for proposals. Restoration on the 246 acre RX Ranch is to begin as soon as funding is available and will take three years to complete. The restoration proposal calls for the following riparian communities to be established: forest (10 acres), savanna (202 acres), and grassland (31 acres) for a total of 246 restored acres.

#### Detailed Site Assessment

The detailed site assessment for RX Ranch will be completed in March 2003.

#### Proposed Restoration Monitoring

See p.33 for monitoring proposed under a grant submitted to the 2001 CALFED ERP program.

#### Projected Orchard Removal

If funding becomes available, the orchards would be removed beginning in the fall of 2003. If the funding is not secured or is delayed, the young orchards have at least 20 productive years, however the older almond orchard should be removed in one to two years.

#### Vertebrate Pests

Both ground squirrels and deer are agricultural pests at this location.

#### Weed Control Program

The weed of greatest concern currently is the Tree of Heaven (*Ailanthus altissima*), which should be removed during the summer and fall of 2003 before the problem worsens. The other weed of concern is

Bermuda grass (*Cyanodon dactylon*) that has developed as an under story in the young walnuts, which will be difficult to eradicate prior to planting California native grasses and forbs.

## **Issues**

### Flooding

There is regular flooding with the walnuts being submerged first followed by the almonds.

### Trespassing/Litter

Both of these problems occur on a regular basis at the RX Ranch. There is an entry to the neighboring riparian forest the south end of the small abandoned orchard. This area has DFG signage and shows signs of being used by ATVs. There is also a well-used entry point at the neighboring Capay property as well. Large junk items such as mattresses and other trash are dumped at the end of County Road 23.

## **Adaptive Management Checklist**

### Research and Monitoring

See p.33 for research and monitoring proposed under a grant submitted to the 2001 CALFED ERP program.

### 3. Capay (formerly Kaiser)

#### Property Description

The Capay Unit, which is owned by USFWS, is a large block of former row and field crop ground adjacent to the Sacramento River. Historical, 1950 aerial photos of the 667-acre property show only an 80-acre field in cultivated crops with large portions of the site cleared but not under cultivation. When the property was acquired in 1999 a center pivot system and additional well had been installed, and the property had 360 acres in irrigated row crops and an additional 175 acres in dryland grain.

Restoration is scheduled between 2003 and 2006 pending the award of CALFED funding. After the purchase the property was fallowed for two years and in 2002 it was leased out to two different lessees who planted corn, sunflowers, and winter wheat. The property will be kept in farming for weed control until the restoration begins.

Many of the sloughs and edges have been passively restoring themselves for the past three years with some native trees such as the box elder (*Acer negundo* var. *californicum*). The main concern of weeds is the perennial pepperweed (*Lepidium latifolium*), a noxious weed that reduces habitat value. The small patches of pepperweed, which at this point can be controlled, were treated by Glenn County in May 2002. The other noxious weed that is abundant is yellow star thistle (*Centaurea solstitialis*), which will also diminish habitat options for wildlife.

**Salient Facts: Capay**

<b>Address of Property</b>	County Road 23, Hamilton City
<b>Property Location</b>	West side of the Sacramento River, South of Hamilton City, on the south edge of Co. Rd. 23.
<b>River Mile</b>	194-193
<b>Acreage</b>	Total: 667 (Remnant riparian 155, Wheat 380, Corn 60, Sunflower 53. Walnuts (abandoned) 19.
<b>Ownership</b>	US Fish & Wildlife Service
<b>Assessors Parcel Number</b>	032-330-001-0, 032-330-006-0
<b>Township/Section/Range</b>	
<b>County Pesticide Use Permit</b>	
<b>Zoning/Land Use/Soil Type</b>	Agricultural;, Columbia loam, fine sandy loam.
<b>Market Value at Purchase</b>	\$1,900,000
<b>Date of Purchase</b>	February 26, 1999
<b>Seller</b>	Andrew Kaiser
<b>Lessee</b>	Mike Millar: Corn, sunflower, wheat 20. Raymond Giesbrecht, wheat 350.
<b>Address</b>	Millar: County Rd. 29, Ord Bend; Giesbrecht: Hwy 162, Butte City.
<b>Phone Numbers</b>	Millar: 530-624-1710 m; Giesbrecht: 530-982-2153 h.
<b>Management/Staff</b>	N/A
<b>Term of Lease</b>	One year
<b>Crop/Varieties</b>	Wheat, sunflower, and corn
<b>PCA</b>	Millar: Mark Ford, John Taylor, 530-934-7727. Giesbrecht: Tom Krause, Helena, 530-521-0849.
<b>Named Waterbodies/Sloughs</b>	Sacramento River, Big Chico Creek across river.
<b>Restored Plant Communities</b>	None.
<b>Endangered Species Present</b>	Bank Swallow colony reported 1998, 1999
<b>Threatened Species Present</b>	Breeding Yellow Warblers
<b>Ecological Sites of Concern</b>	Unnamed slough surrounding property.

<b>Improvements</b>	Power lines, pumps, center pivot.
<b>Wells</b>	Three
<b>Pumps</b>	Two: 1 - 25 HP: R-7182-00-792, Other ?.
<b>Chattel</b>	Pumps, Center Pivot system.

## **Historical and Existing Conditions**

### Farm

The site is part of the active floodplain and historical maps indicated that it was cleared slowly. The NRCS soil map with an aerial photo dated in 1955 showed that only the 60-acre field at the northern edge of the property was planted to row crops. About half of the farm had been cleared, but it appeared to be in grazing rather than dryland grain at the time. During the past 50 years, several small walnut orchards were planted and most of the fields planted to either irrigated row crops or grain. A center pivot and wheel irrigation system was established on the largest 216-acre portion on the south with the best soil.

### Wildlife

According to USFWS surveys, a bank swallow colony (1998-99) was active along the river and a breeding pair of yellow warblers was also observed. Because of the abundance of sloughs and the river, there is abundant wildlife in the area.

### Infrastructure

County Road 23 runs along the north end of the property. There are also two sets of power lines: one originating from the west and one from the southwest. Two pumps and a center pivot structure has been established.

## **Neighboring Habitat Characterizations and Ownership**

### North:

TNC, RX Ranch, almonds and walnuts

### East:

Sacramento River  
M & T Ranch, walnuts.

### South:

Billiou Orchards, ?  
Walter Stile Farming, almonds

### Southwest:

Shahi, Almonds

### West:

Twede, Weems

Community members within two miles:

Hamilton City

**Capay Short-Term Management Plan**

Goals and Objectives

The Capay Unit has been included in pending funding from CALFED to be removed from farming and restored. The current farming is being used to clean up existing weed populations and prepare the site for successful restoration. The planting of wheat allows the use of both a broadleaf weed killer that will reduce the yellow star thistle (*Centaurea solstitialis*) population. Upon final approval of the 2001 CALFED funding, further weed control will be implemented.

Crop Production

The property is being farmed on a flat rate basis by Millar and no yield data has been collected. Giesbrecht is on a percent share and yield information will be added to the farm plan when available.

2003 Farming Schedule

Wheat: The wheat is planted in Oct to December; a broadleaf weed killer, 2,4-D is applied in January, and the crop is harvested in July.

Sunflower: The sunflower seed is planted in April or May, irrigated regularly, treated with a lepidopteron biological agent (*Bacillus thuringiensis*) to control head moth in July, and harvested in September.

Corn: The corn see is planted in April, irrigated regularly, cultivated for weeds, treated with a Johnson grass herbicide, Accent®, and harvested in October or November.

Crop Pests

There are few arthropod pests of wheat, corn, and sunflowers. Sunflowers are often attacked by Head Moth but can be easily treated with selective, biological control. Mites can attack corn, but if the crop is well irrigated it does not usually reduce yield. The primary pests of field crops at the Capay Unit are the annual and perennial weeds, which have developed under cultivation and alternating fallow. Under the following section Vegetation-weeds, some of the more problematic weeds are listed. Cultivation and selective herbicides remain the best tools for controlling weeds.

Non-native Vegetation

Of most concern is the yellow star thistle (*Centaurea solstitialis*), perennial pepperweed (*Lepidium latifolium*) moving into the open field. Of less concern are the bindweed (*Convolvulus arvensis*), curly dock (*Rumex crispus*), fox tail (*Hordeum spp.*), soft chess (*Bromus hordeaceus*), sweet clover (*Melilotus spp.*), prickly lettuce (*Lactuca serriold*), and Johnson grass (*Sorghum halepense*).

Native Vegetation

There is a remnant riparian band along the river and in the sloughs of the open fields there is growth of box elder (*Acer negundo var. californicum*), mugwort (*Artemesia douglasiana*), goldenrod (*Solidago*

*spp.*), willow (*Salix spp*), primrose (*Oenotheria hookerii*), elderberry (*Sambucus mexicana*), and creeping wild rye (*Leymus triticoides*).

#### Special Areas of Concern

- Abandoned walnut orchard should be removed as soon as possible, as it causing pest problems to the neighboring production orchard.
- Perennial pepperweed should be monitored next year to be sure it does not return after being sprayed this spring.

#### **Capay Restoration Plan**

The unit was included in a proposal submitted to the 2001 CALFED ERP request for proposals. Restoration on the 550 acres of agricultural fields is to begin as soon as funding is available and will take three years to complete. The restoration proposal calls for the following riparian communities to be established: forest (155 acres), savanna (355 acres), and grassland (40 acres) for a total of 550 restored acres.

#### Detailed Site Assessment

The detailed site assessment for Capay was completed in 1999.

#### Projected Orchard Removal

There remains a 20-acre abandoned orchard on the west edge of the property next to County Road 23. The proposed CALFED restoration program has funds for removing this orchard.

#### Proposed Restoration Monitoring

See p.33 for monitoring proposed under a grant submitted to the 2001 CALFED ERP program.

#### Vertebrate Pests

There are few vertebrate pests at the site other than deer on the cultivated crops. The balance of the property has a normal complex of vertebrate populations.

#### Weed Control Program

The use of agricultural crops to control weeds is an important portion of the large scale restoration on the Capay Unit. Substantial populations of a number of introduced weedy species have developed during the acquisition process. The lessees are encouraged to use all available methods to control weeds during the farming process. Under restoration Roundup® (glyphosphate) will be used 3-4 times under a non tillage system along with cover crops to allow the restoration species to establish successfully.

#### **Issues**

### Flooding

This site floods often with the primary run off initially occurring from the RX Ranch on the north through the middle of the property to the sloughs. During high flood waters, the majority of the property east of the pump at the RX Ranch/Vereschagin intersection on County Road. 23 is under water.

### Trespassing

Because County Road 23 runs along the north border of this property and dead ends at the riparian forest, it is frequently used as an entry site to the river and riparian areas. In July USFWS built a fence and added gates to the property to control trespassing.

## **Adaptive Management Checklist**

### Research and Monitoring

See p.33 for further research and monitoring that has been proposed under a grant proposal submitted to the 2001 CALFED ERP.

#### 4. Deadman's Reach (formerly Koehnen)

##### Property Description

The US Fish and Wildlife Service owns the Deadman's Reach Unit, formerly owned by C.F. Koehnen and Sons. The unit is primarily agricultural with 305 acres in walnuts and 185 producing acres of almonds out of an original 250-acre almond orchard. There are 67 acres of riparian habitat on the property in narrow strips. The gravel bar to the northwest makes up the majority of this undeveloped acreage. The gravel bar has some giant reed (*Arundo donax*), and there are several patches of *Arundo* and salt cedar (*Tamarix spp.*) along the river edges.

The unit floods on a regular basis. The parcel sits on a nearly 90-degree curve of the river, which borders it to the north and west. The river flows over the top of the property and then onto neighboring properties. The previous owners installed riprap along the bank of the river on the north end of the unit, and a neighbor has placed a riprap levee at the southwest end of the unit. The west side of Deadman's Reach is eroding into the river at the rate of several acres per year, depending on flooding circumstances.

Based on a visual assessment of the almond orchard, the trees are in poor condition. The almond orchard will be removed after harvest fall 2003. The orchard has Bermuda grass throughout and it will be essential to control this weed through fall 2003, before the orchard is removed.

The two large walnut orchards are in excellent condition although trees are lost to erosion every year. It is currently a profitable orchard and should be low priority to restore. The 48-acre walnut orchard in the southeast corner is in good condition but has more missing trees. The 48-acre walnut will be the first to be removed after it is no longer profitable.

There is a shop and a mobile home on about 1.1 acres. The shop is 3,200 square feet constructed of wood and tin. There are power lines to this site and there are eight wells on the property.

**Salient Facts: Deadman's Reach**

<b>Address of Property</b>	9175 River Road, Chico, CA 95928
<b>Property Location</b>	East side of River, North side of Ord Ferry Rd
<b>River Mile</b>	185 – 186.5
<b>Acreage</b>	Total: 622 (Riparian-67, Walnuts-294, Almonds-238)
<b>Ownership</b>	US Fish & Wildlife Service
<b>Assessors Parcel Number</b>	39-04-06, 05
<b>Township/Section/Range</b>	21N, 1W, 27, 28, 33, 34, 31, 32
<b>County Pesticide Use Permit</b>	04-02-0408818
<b>Zoning/Land Use/Soil Type</b>	A-40. Columbia Sandy Loam (SE Side), 1/3 is Columbia Very Fine Sandy Loam (NW Side)
<b>Market Value at Purchase</b>	\$4,151,413
<b>Date of Purchase</b>	August 12, 1999
<b>Seller</b>	C.F. Koehnen and Sons
<b>Lessee</b>	C.F. Koehnen and Sons
<b>Address</b>	3131 Hwy 45, Ord Bend, CA, 95943
<b>Phone Numbers</b>	Office 530-891-5216, Fax 530-934-2613
<b>Management/Staff</b>	Kalin Koehnen, Mike Koehnen
<b>Term of Lease</b>	Almonds: ends October 30, 2002, Walnuts: October 20, 2006
<b>Crop/Varieties</b>	Walnuts (Hartleys) and Almonds (Mix)
<b>PCA</b>	Mark Keenan, John Taylor Fertilizers, 570-6294 Mobile
<b>Named Waterbodies/Sloughs</b>	Sacramento River
<b>Restored Plant Communities</b>	None
<b>Endangered Species Present</b>	Unknown
<b>Threatened Species Present</b>	Unknown
<b>Ecological Sites of Concern</b>	Riprap bank of river, southern drain, and eroding bank.
<b>Improvements</b>	Trailer house and shop. Shop is 3,200 Square feet,

<b>Wells</b>	Eight
<b>Pumps</b>	4 - 100 HP, 50 HP, 60 HP, 175 HP and 30 HP
<b>Chattel</b>	Pumps

### **Historical and Existing Conditions**

The Deadman's Reach Unit was cleared over 60 years ago and farmed in much of the higher elevation ground to row crops. The property was previously owned by the Kimmelshue family and was purchased by C. F. Koehnen in 1976. The property was leveled after being acquired and the orchards planted.

#### Agriculture

There are three blocks of walnuts and one large block of almonds. The almond orchard was planted in 1978 and the 48 acre walnut block was planted in 1979. Flooding from the 1983 storm season caused considerable damage to these blocks at that time. Fifteen acres of the almonds were replanted and 28 acres of the walnuts were planted. The two largest blocks of walnuts, all Hartleys, were planted in 1983 and comprised 267 acres combined. Currently, the Sacramento River has eroded approximately 55 acres on the northern and westerly border of the F1 Block.

#### Wildlife

Wildlife surveys will be completed in March 2003 with the baseline assessment. The riparian areas are primarily along the northern edge along the river and the balance of the ranch is bordered by other crops with the exception of a slough on the south border that leads away from the unit through neighboring properties.

The eroding bank to the west has created potential habitat for bank swallows.

#### Infrastructure

There is a trailer house and a shop on approximately 1.12 acres. The shop is 3,200 square feet with a steel roof, electricity, water cooler, and a dirt floor. There is a 20 x 20 foot wood shed. There are eight wells on the property.

### **Neighboring Habitat Characterizations and Ownership**

#### North

English Unit, USFWS, remnant forest.

#### East

Bach property, farmed by Keyawa, walnuts.

#### South

? almonds.

Keyawa, walnuts.

#### West

Sacramento River

Community members within one mile

Ord Bend, Nichols Ranch, Llano Seco Rancho, Gilbert Moss, and Bremner Orchards

**Deadman's Reach Short-Term Management Plan**

The almond portion of this unit has become an unprofitable orchard and should be removed in fall 2003 if funding is available. The walnut orchards will handle the flooding better and are in fairly good condition. These should be farmed for five more years. The smaller 48 acre walnut orchard is in the poorest condition and may be considered for restoration if it deteriorates. The two large blocks of Hartleys should produce very well for five more years, but they are in danger from the river. During high water events, the river can undermine the existing riprap that is between the Koehnen and Keyawa orchards, and erode the bank on the north and west sides.

Crop Production

2000: Walnuts 950,000 in shell lbs, Almonds 220,000 meats

2001: Walnuts 898,055 in shell lbs, Almonds 214,673 meats

2002: n/a

Income

2000 - Almonds \$39,800 Walnuts-\$117,600

2001 - \$143,200 total

2002: n/a

2003 Farming Schedule

Winter: Prune dead limbs, burn in orchard or open area.

Spring: Control walnut blight before rains with USFWS approved materials. Use trap counts to monitor for codling moth and treat when necessary to avoid losses. Irrigate when necessary to maintain optimum tree health. Cut and burn dead trees to control diseases. Control weeds by mowing in rows and by contact herbicides in tree rows.

Summer: Control codling moth, mites, aphids, and walnut husk fly with an approved material or method. Irrigate when necessary to maintain optimum tree health and yield. Control weeds as needed to keep trunks clean.

Fall: Harvest as soon as is practical for the best yield and quality. Dry and market walnut crop.

Orchard Pests

walnut blight (*Xanthomonas campestris var juglandis*)

codling moth (*Laspeyresia pomonella*)

mites (*Tetranychus spp.*)

navel orangeworm (*Amyelois transitella*)

ground squirrels (*Otospermophilus beechyi*)

navel orangeworm (*Amyelois transitella*)

### Non-native Vegetation

The orchard floor contains annual rye grass (*Lolium multiflorum*), annual blue grass (*Poa annua*), foxtail (*Hordeum spp*), filaree (*Erodium spp*), and Bermuda grass (*Cyanodon dactylon*). The orchard borders contain Johnson grass (*Sorghum halepense*). There are a few populations of salt cedar (*Tamarix spp.*), giant reed (*Arundo donax*), and spurge (*Euphorbia spp.*) along the river in the riprap. There is a controllable population of *Arundo* on the gravel bar, which should be sprayed as soon as possible.

### Native Vegetation

Native plants growing along the orchard borders are: California blackberry (*Rubus ursinus*), valley oaks (*Quercus lobata*), and willows (*Salix spp.*), as well as little patches of creeping wild rye (*Leymus triticoides*), and pipevine (*Aristolochia linguistifolia*).

### Special Areas of Concern

- The west bank has lost an estimated 60 acres to the river
- There are brush piles along the edge of the riprap to the north which will be relocated to the orchard and open areas.
- Water flows off the south end of the property and this site should be studied further.

## **Deadman's Reach Restoration Plan**

### Goals and Objectives

The unit was included in a proposal submitted to the 2001 CALFED ERP request for proposals. Restoration on the 238 acre-almond block is to begin as soon as funding is available and will take three years to complete. The restoration proposal calls for the following riparian communities to be established: forest (55 acres), savanna (100 acres), and grassland (83 acres) for a total of 238 restored acres.

### Detailed Site Assessment

The detailed site assessment for Deadman's Reach will be completed in March 2003. The detailed site assessment will be used to refine the restoration planning to detail species and their frequencies to be established in the three proposed restoration communities.

### Proposed Restoration Monitoring

See p.33 for monitoring proposed under a grant submitted to the 2001 CALFED ERP program.

### Vertebrate Pests

There are ground squirrels and deer. The squirrels will become a greater concern when the almond orchard is removed and should be controlled.

### Weed Control Program

The *Tamarisk* and *Arundo* along river near the riprap should be controlled with spot treatments. The lessee has reported that the annual rye grass (*Lolium multiflorum*) infesting the site is resistant to Roundup. Other farmers in the area have reported this as well.

### Orchard

Projected Orchard removal

Almonds - Fall 2003  
Walnuts - 2008-2012

## **Issues**

### Flooding

During a flood, the water moves over the property, so there is no standing water, and thus minimal tree death. Debris needs to be cleaned up on the south side of the property after flooding. The floodwater tends to erode and scour the area where the water leaves the property. Another potential problem is that the river continues to cut into the bank on the west side and could cut behind the neighbor's riprap at the entrance to the property, causing channeling and more loss of property.

### Trespassing/Litter

Some litter is left by fishermen but there generally is none of the large litter and trash that is often dumped at other sites.

### Adaptive Management Checklist

Monitor invasive weeds, especially salt cedar (*Tamarix spp.*), giant reed (*Arundo donax*).

Monitor ground squirrel populations after almond orchard removal.

See p.33 for further research and monitoring that has been proposed under a grant proposal submitted to the 2001 CALFED ERP.

## 5. Ward

### **Property Description**

The Nature Conservancy owns this property, and once restored, it will be turned over to the California Department of Parks and Recreation, which owns the property to the south of the Ward piece. The former prune orchard is leased to row crop farmers who plant wheat or safflower on the property annually. The crops keep the land in production and provide cover and forage for a wide variety of wildlife and birds. Farming the property until CDPR acquires the property also eliminates noxious weeds and will lead to much more successful restored stands of California native grass.

There are many native plants and trees on this land, in the sloughs, wetlands and on the gravel bar. Unfortunately, there are young pecan trees sprouting up along the slough, from the orchard that was removed in spring 2002. These will compete with the native overstory trees such as oaks, sycamores and others, and will be removed in 2003 and 2004.

**Salient Facts: Ward**

<b>Address of Property</b>	East side of Roberts Road, Colusa
<b>Property Location</b>	West side of Sacramento River, East of Hwy 45, 1 mile north of the City of Colusa
<b>River Mile</b>	145
<b>Acreage</b>	Total: 238 (open field-177, Riparian-48, Roads, etc-13)
<b>Ownership</b>	The Nature Conservancy
<b>Assessors Parcel Number</b>	15-070-121
<b>Township/Section/Range</b>	T16N R1W Sec 17, 18, 19
<b>County Pesticide Use Permit</b>	
<b>Zoning/Land Use/Soil Type</b>	FW/Agriculture/Columbia Loam: 40%, Columbia Silt Loam: 35%, Columbia FSU-10%, CSU-15%
<b>Market Value at Purchase</b>	\$965,812
<b>Date of Purchase</b>	April 19, 2001
<b>Seller</b>	Nancy Zumwalt Ward
<b>Lessee</b>	Raymond Giesbrecht
<b>Address</b>	Butte City
<b>Phone Numbers</b>	530-982-2153 h, 530-517-1464 m
<b>Management/Staff</b>	
<b>Term of Lease</b>	July 31, 2003
<b>Crop/Varieties</b>	Wheat/Safflower
<b>PCA</b>	Tom Krause, 530-521-0849
<b>Named Waterbodies/Sloughs</b>	Sacramento River
<b>Restored Plant Communities</b>	None
<b>Endangered Species Present</b>	Unknown
<b>Threatened Species Present</b>	Unknown
<b>Ecological Sites of Concern</b>	Unknown
<b>Improvements</b>	Power poles to pump near river

<b>Wells</b>	None
<b>Pumps</b>	One, ? HP
<b>Chattel</b>	None

### **Historical and Existing Conditions**

The property is on the west of the Colusa Weir and across from the Colusa Bypass causeway which over flows to the east. Since the establishment of the levee system, the center of the property has been a seasonal lake and had been planted in the past to pecans on 15 acres. The balance of the property has been in prune production. In spring 2002 the 73 acres of prunes were removed and the property planted to wheat. The wheat will both provide farm income and wildlife habitat until the property is restored.

### Wildlife

Wildlife should be abundant in the sloughs and along the river, especially since the south side of the property borders a state park. The northern portion of the park, which borders the property, has about 20 acres of riparian forest.

### Infrastructure

There are a few dirt roads across the property, and power poles to the pump near the river.

### **Neighboring Habitat Characterizations and Ownership**

#### North

Yosemite Farms, Prune orchard which was removed spring 2002

#### East

Sacramento River  
DFG, Sutter Bypass

#### South

California Department of Parks and Recreation

#### West

SW, Forry walnut orchard  
NW, Cerney walnut orchard

#### Communities within one mile:

City of Colusa

## **Ward Short-Term Management Plan**

### Goals and Objectives

Until CDPR has approval and funding to restore the property, it will be kept in agricultural production. Currently the lessee has planted wheat and will rotate with Safflower to produce income, clean up noxious and invasive weeds near the park, and provide habitat for wildlife. The future restoration schedule in Colusa County will determine the length of time that the property remains in agricultural production.

### Income

2001 - 15%. \$?

2002 – No Production

### 2003 Farming Schedule

- Winter. Control weeds with approved California Department of Pesticide Regulation (DPR) herbicides to produce a crop and eliminate noxious and invasive weeds.
- Summer. Harvest as soon as is practical for best yield and quality. Dry and market the wheat crop. Control noxious, perennial summer weeds with cultivation.
- Fall. Prepare a seedbed and plant a winter crop, i.e. wheat, forage, or oats.

### Pests

The primary pests of the wheat crop are weeds which have become established from the many years of prune farming and as a repository of rivers as the backwater wash of the Colusa Bypass.

### Non-native Vegetation

There are many overstory non-native trees on the property, such as edible fig (*Ficus carica*), feral pecans, and old English walnuts (*Juglans regia*). Additionally, there are patches of perennial pepperweed (*Lepidium latifolium*) along the borders of the slough. Also abundant were riggut brome (*Bromus rigidus*), Bermuda grass (*Cyanodon dactylon*), bindweed (*Convolvulus arvensis*), and a great deal of Johnson grass (*Sorghum halepense*)

### Native Vegetation

There are many sloughs and riparian areas on this property. Some of the natives seen were: blue wild rye (*Elymus glaucus*), California wild grape (*Vitis californica*), box elder (*Acer negundo* var. *californicum*), California button willow (*Cephalanthus occidentalis* var. *californica*) cottonwood (*Populus fremontii*), elderberry (*Sambucus mexicana*), Oregon ash (*Fraxinus latifolia*), valley oak (*Quercus lobata*), western sycamore (*Platanus racemosa*), and several species of willows (*Salix spp.*).

### Special Areas of Concern

The mouth of the Colusa Bypass is directly east of the property where active erosion is occurring on the Ward property.

## **Ward Restoration Plan**

### Goals and Objectives

The Ward property is within the Colusa Subreach. TNC was awarded a 2001 CALFED grant to conduct subreach planning which will begin as soon as funds are made available from CALFED. Until restoration planning is complete, we will concentrate our efforts on cleaning up noxious invasive weeds and continue farming portions of the property with row crops.

### Detailed Site Assessment

TNC will conduct a detailed site assessment for Ward when the Colusa Subreach Plan is completed, expected in 2007.

### Vertebrate Pests

There are not any other close crops except for the northern neighbor. There is abundant wildlife, i.e. deer, squirrels, and gophers but they are minimally considered pests to the wheat. Large flocks of migratory waterfowl could damage areas of the wheat early in the year of the season wetland should develop a landing area. There would be concern about the effects of squirrels and gophers on the integrity of the western levee system.

### Weed Control Program

Hand crews should be sent to this site to remove the pecans in the slough that runs east-west through the center of the property. The crew should use pruners, saws and undiluted Garlon®, and cut down the feral pecan trees and paint the stumps with herbicide the same day.

## **Issues**

### Flooding

There is considerable flooding at this site as the backwash of the Colusa Bypass. A considerable history of flooding over the past ten years can validate the role the property plays in flood pressure on the Colusa infrastructure.

### Trespassing/Litter

Despite the close proximity of the property within a mile of the town of Colusa, there was not any litter or obvious trespassing during visits to the property.

## **Adaptive Management Checklist**

### Research and Monitoring

Bird monitoring by Point Reyes Bird Observatory will be implemented on the property.

## **Short-Term Research and Monitoring Activities**

The following three tasks are research and monitoring proposed for funding under the CALFED 2001 ERP. Tasks 1 and 2 are specific to RX Ranch, Capay, and Deadman's Reach. Task 3 may be applied to all properties where restoration is conducted.

### **Task 1: Cover crop weed suppression trials**

Tracts – This experiment will be conducted on the grassland portion of RX Ranch, Capay, and Dead Man Reach.

Plot design – We will establish one plot (45 m x 100 m) at RX Ranch, Capay, and Dead Man Reach restoration tracts. Each plot will contain nine treatment strips 5 m x 100 m with 1 m buffer strips between each treatment strip. There will be three treatments randomly assigned to three strips each for a total of nine strips per plot.

Treatments – Three treatments will be used in this experiment: 1) a cover crop of bell beans and peas, 2) a standard mowing and herbicide application using glyphosphate (trade name Round-Up), and 3) a control treatment where only mowing will be conducted. It would not be a productive use of resources to have a non-NIS control treatment since all sites are completely dominated by NIS vegetation. TNC has used non-NIS control methods in the past and all such restoration tracts receiving this treatment have failed to meet USFWS standards for successful restoration (TNC 1996, 2000, Peterson 2002).

Monitoring - The four replications will be monitored using a random transect line with 10 locations per line each 5 m apart. The number of established native grasses will be counted and recorded using a 20-cm<sup>2</sup> ring. The monitoring will be conducted three times a year (in February, May, and October) for two years. The data will be analyzed and compared for total number of established grasses in the cover crop treatment, standard treatment, and control.

Statistical Analysis – We will use analysis of variance (ANOVA) to explore how the treatments may affect native grass establishment.

### **Task 2: Manipulative experiments in new and old restoration tracts.**

Tracts – Experiments will be conducted at six tracts, including Capay, RX Ranch, and Deadman's Reach, as well as two tracts restored by TNC over 10 years ago: Kopta Slough and River Unit. It is necessary to conduct the experiments at two older tracts in order to be able to test the hypothesis regarding overstory cover, since sufficient overstory cover will not establish in the newer tracts during the course of the study period.

Plot design – All manipulations will be conducted on 10 x 10 m plots, which will be divided to test different hypotheses. There will be a 1 m buffer around the edge of the plots within which no measurements will be taken. There will be no introduction of species in a 3 x 8 m strip on one half of the plot where natural vegetation dynamics will be monitored. The other half of the plot will be subdivided into six 2 x 2 m plots with 1 m buffers separating them. One of each of the six focal species will be planted into each of these plots.

Focal species – We will introduce six focal species, which are common in the remnant riparian forests and could be potentially used for restoration. We have chosen focal species that represent a range of

growth forms and dispersal mechanisms that represent important wildlife bird habitat and/or food resources. These are pipevine (*Aristolochia californica*, gravity-dispersed vine), Santa Barbara sedge (*Carex barbarae*, gravity-dispersed herb), California blackberry (*Rubus ursinus*, animal-dispersed shrub), California grape (*Vitis californicus*, animal-dispersed vine), mugwort (*Artemisia douglasiana*, wind-dispersed herb), and clematis (*Clematis ligusticifolia*, wind-dispersed vine). Plants for which it is possible to collect sufficient seed and are known to have moderately high germination rates (e.g., *Artemisia*) will be seeded, whereas species for which the germination ecology is not well understood (e.g., *Carex*) will be planted.

Treatments – At all tracts treatments will be set up with high competition from NIS vegetation and reduced competition from NIS vegetation (it is impossible to completely eradicate NIS vegetation). In the reduced competition experiment all exotic species will be herbicided and removed in fall 2003. The soil will then be irrigated and solarized to reduce NIS seed bank. During the experiment a grass-specific herbicide will be used to control NIS vegetation in combination with hand weeding of particularly problematic non-grass species. It is recognized that this level of NIS control is not practical on a large scale, but Sub-task 1 will test which strategy (herbicide or cover crops) is most effective for NIS control.

In order to assess the effect of proximity of forest on colonization and establishment of non-tree native species, plots will be set up at two distances from the edge of a remnant forest (near: <50 m, far >250 m) at four tracts (Kopta, Phelan Island, Rx Ranch, Capay). These distances were selected based on the overall range of distances from forest observed in these sites, as well as species distribution and dispersal patterns documented in preliminary surveys in this system and Dr. Holl's research elsewhere. The other two new tracts (Sunset Ranch and Dead Man Reach) do not have sufficient remnant forest close by.

At Kopta and Phelan Island, treatments will be repeated both in open areas and areas with overstory cover of riparian tree species (e.g., *Acer negundo*, *Populus fremontii*) to test the effects of overstory cover on competition.

All treatment combinations will be replicated three times within each tract. Replication within each tract is necessary given the high between tract variation. Each of the tracts has a varied management history and, therefore, the tracts themselves cannot be considered as replicates. It is important to repeat these experiments across tracts to assess the generalizability of the effects of different management strategies. In total there will be 84 plots: Kopta and River Vista (24 each), Capay and Rx Ranch (12 each), Sunset Ranch and Ord Ferry (6 each).

Environmental Measurements – Clearly, competition between native and NIS vegetation will be affected by a number of abiotic factors, such as soil nutrients and texture, floodplain position, and groundwater depth. It is impossible to replicate the outlined treatments across replicated combinations of each of these abiotic factors, but it is important to quantify them to explain potential variations in responses across tracts and we will study their effects in more detail in Task 3, sub-task 3. We will collect surface soil samples (0-10 cm) in all plots and have them analyzed for texture, pH, and basic nutrients at the University of California, Davis Analytical Laboratory. In each of the locations where there are plots, we will drill one soil core to quantify soil stratigraphy and to determine depth to groundwater. We will also determine relative position on the floodplain of each plot by GPSing the location and overlaying them with detailed elevational models being developed by Dr. Steve Greco (UC Davis).

Monitoring - Plants will be seeded in fall and planted in winter of the first year and reseeded and planted the following year if high mortality rates prevent continuation of the study. We will monitor germination

of seeded species in February, 2004 and tag or record cover (depending on abundance) of all naturally establishing seedlings in the non-seeded subplots. To parallel the surveys described in Task 3, sub-task 3, woody species recruitment will be monitored in five, 1 x 1 m plots. We will survey the entire strip for the presence of focal species. We will monitor survival and growth of planted seedlings and cover of native and exotic species at the end of the rainy season (late-April/early May), mid-summer (July) and again at the end of the dry season (September) in the first year and at the end of the rainy and dry seasons in the following years. In addition to monitoring planted and naturally establishing vegetation, we will also monitor seed dispersal by air and water in the second and third years of the study (once the plots are set up). This information will help to determine whether lack of establishment of certain native species is due to lack of colonization or by inappropriate conditions for establishment. It will also provide information regarding the seed rain of NIS vegetation to separate out the role of the seed bank vs. ongoing input of seeds from surrounding areas.

Statistical Analysis – The data will be analyzed using multi-way ANOVA with site, distance to forest, overstory cover, and NIS cover as independent variables, and survival and growth of planted species and cover of naturally establishing species as dependent variables.

### **Task 3: Survival and Height Monitoring**

This monitoring is carried out on all tracts restored by TNC. Tract-specific measurements of the establishment, survival, and growth of plantings provides a first and most basic measure of project success or failure. Measurements at restoration tracts determine if planting has met design specifications, indicate initial success, and encourage the development of better restoration techniques. Performance measures will consist of three monitoring phases for each of the four tracts during the three-year life of the project. These monitoring phases will include: 1) 30-day post-planting evaluation, 2) end of growing season monitoring, and 3) project completion monitoring.

The 30-day post-planting monitoring will be conducted one month after all riparian species have been planted. Based on previous monitoring results, a census conducted on 10% of each community type planted adequately captures survival per species per community (Sacramento River Project 1999, 2000). Results from the 30-day post-planting monitoring will provide baseline establishment and survival data against which end of growing season and project completion monitoring will be compared. End of growing season monitoring will be conducted in December for the three year life of the project while project completion data will be collected once in final fall of the project. In addition, TNC will measure average height of all planted species (potted stock and cuttings) at each monitoring phase. This will permit comparisons of species growth across different restoration tracts.

TNC will require the contracted farmers to meet an 80% survival rate averaged across all potted stock trees and shrubs, acorns, and cuttings as well as 80% frequency for understory forb and grass species. The 80% survival and frequency requirements must be met at the end of each growing season and project completion monitoring phases in order for contracted farmers to be paid for their restoration activities. TNC uses an 80% survival rate because, to date, this has been the minimum survival rate monitored at TNC restoration tracts and therefore this has been an easy goal for contracted farmers to meet. If a farmer does not meet the 80% requirement, TNC will conduct a more in-depth census to determine if factors outside the control of the farmer were responsible for poor species performance.

## **Detailed Site Assessment Protocols**

As a routine part of the development of conservation management and monitoring planning scenarios for specific floodplain properties on the Sacramento River, we recommend that detailed site assessments be performed. These detailed assessments complement the coarse-scale routine baseline assessments that were completed for all of the 97-NO2 properties as part of this grant.

Detailed site assessments are routinely performed to characterize conservation properties and inform restoration and management planning. Detailed site assessments serve the dual purpose of defining baseline conditions and informing restoration potential. A detailed site assessment has been completed for Capay, while assessments for RX Ranch and Dead Man's Reach will be completed in March, 2003. Detailed site assessments will be completed for Gunnhill and Ward once restoration funds are secured.

Although detailed site assessment activities are tailored to the individual circumstances at each property, the following provides a list of standard tasks that are typically completed during the assessment process:

### **Site Mapping and Characterization**

Mapping and describing the physical character of the site is the first filter through which the restoration planning process begins. A detailed site map with distances, elevation, and location of each planting area is needed for determining the field layout and the planting design. For example, low lying, frequently flooded areas are not appropriate for flood intolerant species or communities such as valley oak riparian forests that are typical of high terrace, less frequently flooded sites.

All available county soil maps and aerial photos are collected to provide general information on physical conditions. Aerial photos are consulted to map the location of historic channels and vegetation on the floodplain. Historic vegetation patterns are examined to better understand how soil stratigraphy at the site may affect future restoration plantings. 1" to 200' scale maps and photos are typically used for these analyses as they provide suitable resolution for identifying patterns that are relevant to restoration planning (e.g., informing plant design).

For each field within the restoration unit the following attributes are defined: landform (historic point bar, cutoff, terrace), subreach (active or stable), adjacent tributary confluence (yes or no), landscape position (low, medium, high terrace), erosion projection (within 150 year meander zone), and reach activity (eroding or accreting side of channel). Topography is estimated from aerial photos and on site surveys.

### **Soil Profile**

Field mapping of the soil profile is necessary to achieve the level of detail needed for planning restoration units. Breaks in vegetation community, elevation, and surface soil texture are used to delineate planting areas. Boreholes are augured to characterize the soil profile for each planting area.

Typically, soil data are collected from digging at least 1 borehole location per acre for each field to be planted, more if needed to refine apparent soil discontinuities. Textural analysis is done following the SCS/NRCS texture by feel method at 1' increments for each borehole. Depth to refusal (unconsolidated materials, the water table, or greater than 15' depth) is noted as well as the water table depth. Borehole locations are georeferenced and compiled in a soil borehole location GIS layer.

### Estimations Flood Frequency and Duration

Information on flood frequency and duration inform which species and riparian community are appropriate for the various areas of a restoration field. We use estimated flood frequency GIS layers created by DWR to plot flood interval lines on each restoration field. In addition, flood duration is calculated from the closest gage station and adjusted for elevation.

### Characterizations of Adjacent Riparian Vegetation Communities

The vegetation survey maps community types for adjacent vegetation and lists the most obvious plant species within surrounding vegetation at each site. Community typing follows Holland (1986). Community typing is qualitative and is based on visually dominant species, overall species list and frequency data rather than complete quantified sampling for community composition. Intergradations occur for most community types in the riparian vegetation. Listing of the visually common plant species is performed using point-quarter sampling and site reconnaissance. Adjacent vegetation surveys are used as a reference for potential vegetation communities and thus planting recommendations per site.

In addition to on the ground sampling, we conduct a literature search and query of the California Natural Diversity Database (CNDDDB) to determine potential and known occurrences of threatened and endangered plant species occurring within 1.0 miles of the restoration site. The CNDDDB search is done using USGS 7.5' series quadrangles.

### Wildlife Records

Wildlife surveys are conducted within riparian vegetation and associated habitat adjacent to each restoration site. We conduct a site survey for birds using a point-count method and potential non-native mammal species within the immediate area. In addition, we conduct a literature search and CNDDDB database query for potential special status wildlife species within 1.0 mile of the site based on aerial photographs, field surveys of potential available habitat, and information gathered from the occurrences of special status species.

### Revegetation Comparison

An analysis of replanting success for similar re-vegetation sites is conducted to inform the restoration planning process. This information is useful for determining the potential of species specific performance given site conditions. Typically, we select the three most physically similar sites (based primarily on soil stratigraphy and flooding) and summarize the survival (%) and growth (inches/year) for each species within each plant community type planted.