Project 199205900 – Response to ISRP comments

Issue 1: presenting objectives that are more specific and measurable:

In the following text, we have taken the objectives, task, and methods as presented in the narrative section of the original proposal and modified or supplemented the wording in an effort to define the objectives in more specific and measurable terms.

In addition, we have deleted Objective 1, Task C, because it was an inadvertent repetition of Objective 2, Task A

Objective 1 - Implement wildlife habitat management activities as outlined in the Willow Creek management plan to maintain a baseline of 740 habitat units and provide additional habitat units through control of non-native plant and animal species, enhancement of oak savanna, and restoration/enhancement of upland prairie, wet prairie, and ash savanna habitats.

Objective 1, Task a - Continue non-native vegetation control efforts; reduce or eliminate the top 10 problem non-native plant species from the site.
Methods - A variety of methods have been, and will continue to be utilized to control invasive plant species. The methods of choice vary for different species, but include manual clipping or removal, mowing and other mechanical treatments, covering vegetation with opaque plastic, and spot spraying of herbicides. These activities will occur in selected areas of all habitats, depending upon the distribution of each target species.

Objective 1, Task b - Reduce adult bullfrog populations by 50% from pre-control levels.
Methods - The primary means we are using to reduce bullfrog populations is removal of egg masses during the breeding season. In some years when water levels get low, we can supplement this approach with the removal of tadpoles as they become concentrated in small pools.

Objective 1, Task d - Enhance three acres of oak woodland by reducing trunk density and removing non-native understory vegetation. **Methods -** Enhancement would be accomplished by reducing trunk density and removing invasive non-native understory vegetation, particular Himalaya blackberry. This would increase the structural diversity and productivity of the oak woodlands for target wildlife species. Remaining oaks would be provided with greater space for canopy development, while girdled and felled trunks provide standing and down coarse woody debris for wildlife use.

Objective 1, Task e - Restore eight acres of invaded wet prairie to wet prairie and ash savanna habitats.
Methods - Work crews will be hired to use chain saws to manually remove invading woody vegetation (mostly common pear and Oregon ash) that has invaded open prairie habitat. This work will be done in late summer and early fall when impacts to the existing habitat are minimized.

Objective 1, Task f - Restore native grasses and forbs to establish one acre of native upland prairie on former agricultural land.
Methods - This task will involve site preparation to eliminate existing non-native vegetation, collection or propagation of native grass and forb seed, and planting of one acre of former agricultural land.

Objective 1, Task g - Install and monitor "soft" erosion control methods on streambanks and at nickpoints.
Methods - Willow stakes and bundles, and straw pillows contained within jute netting, will be installed to stabilize localized occurrences of bare stream banks and eroding stream channels.

Objective 2 – Ensure that adaptive management principles are applied to introduced species management activities.

Objective 2, Task a – Implement monitoring and evaluation of invasive and non-native species control activities. Both quantitative and qualitative methods are used to monitor invasive species control efforts. In wet prairie habitat, a series of permanent vegetation monitoring plots have been established, and data on plant species abundance are gathered annually. In addition, an extensive series of permanent photo stations has been established to visually document changes in habitats undergoing active management. The response of selected wildlife species will be monitored by surveys of selected species and species groups, and documentation of noteworthy wildlife observations.

Objective 3 - Monitor selected hydrology and water quality conditions within the Willow Creek site to establish long-term baseline conditions, and to compare with previous baseline data regarding stream flows and water quality inputs to the Willow Creek site.

Objective 3, Task a - Monitor hydrology and water quality conditions.
Methods - Ensuring that suitable hydrologic conditions are maintained is important to maintaining and improving wetland and aquatic habitats for wildlife. Under this task we will monitor a series of groundwater wells to document groundwater patterns, and six staff gauges to document changes in water levels in beaver ponds. We also will gather baseline data on stream flows (stage measurements) by installing an automated device at one location on the site. The flow data will be used to document baseline conditions, and to calculate loadings of any pollutants that are detected in water quality monitoring. Much of the data gathering and data analysis will be performed by students at Churchill High School, which is located about 1 mile from Willow Creek.

Objective 3, Task b - Continue precipitation monitoring.
Methods - We will use an automated rain gauge to document precipitation during the project period. Because the nearest official rainfall measurement station is located 10 miles away, and because precipitation varies locally depending upon variations in topography, we believe it is important to have a local precipitation record to use for calculating and modeling stream flows under alternative future land use conditions.

Objective 3, Task c - Continue turbidity monitoring.
Methods - We monitor turbidity at least twice a month at a series of eight sampling locations. Measurements are made with an Orbeco-Hellige Model 966 portable turbidimeter.

Objective 4 – Ensure that adaptive management principles are applied to wildlife habitat management activities by monitoring selected wildlife species to document wildlife use and response to management treatments.
Objective 4, Task a – Monitor response of selected wildlife species to prescribed burning and other management actions.
Methods – A variety of techniques, including time constrained searches, point counts from permanent monitoring stations, and qualitative observations, will be implemented to gauge the response of wildlife species to habitat changes in areas under active management. If the above monitoring indicates that there are certain on-site problems related to hydrology or aquatic habitat conditions, we will use an adaptive management approach to revising and updating management and enhancement activities.

Objective 5 - . Identify impacts to the ecological viability of the site, and reduce identified impacts to ecologically acceptable levels.

Objective 5, Task a - Continue volunteer defensibility monitoring
Methods - Volunteers make monthly visits to a set route on the site, and record observations of visitor use and other public use problems, changes in hydrology, wildlife sightings, and plant phenology. These observations are useful for documenting short term issues as well as more general changes and patterns on the site.

Objective 5, Task b - Maintain or update public use signage and entry controls (gates and fences) as necessary.
Methods - Limited amounts of wear and tear as well as vandalism require that we replace signage and entry controls from time to time. This ensures that we are able to protect habitat quality from disturbance related to unauthorized uses of the site as best possible.

Project 199205900 – Response to ISRP comments

Issue 2: presenting a more evaluative description of results assessing successes and failures:

In the following text, we have taken the objectives, task, and methods as presented in the narrative section and tried to briefly summarize the results of our management activity to date. The wording and organization of the scopes of work has changed only slightly since the implementation of this management activity began in 1996, so the response are organized relative to the tasks contained in our FY 03 proposal.

We should note that we currently have underway a project to perform a modified HEP on the portion of the site originally brought into the BPA Wildlife program in 1996. This modified HEP, when completed, will help to quantify the increase in habitats units for target species that have accumulated as a result of our restoration and enhancement activities since 1996.

Objective 1, Task a - Continue non-native vegetation control efforts; reduce or eliminate the top 10 problem non-native plant species from the site.
Methods - A variety of methods have been, and will continue to be utilized to control invasive plant species. The methods of choice vary for different species, but include manual clipping or removal, mowing and other mechanical treatments, covering vegetation with opaque plastic, and spot spraying of herbicides. These activities will occur in selected areas of all habitats, depending upon the distribution of each target species.

Results, successes, and failures: We have focused on the following non-native plant species: Scotch broom, reed canary grass, Harding grass, tall oatgrass, creeping velvet grass, Himalaya blackberry, English ivy, European pear, English hawthorn, and bull thistle. Although many other non-native plant species occur on the site, these have been the primary focus of control efforts because they the have the greatest capacity to greatly affect the function of native habitats and target species. Of the species mentioned, most occur or occurred in small patches and were only beginning to establish on the site. For such species, our goal is to completely eradicate them from the site. To date we have identified and mapped all known colonies, and have implemented initial treatments as well as follow-up treatments for all species except English hawthorn and European pear. Many of these species require further treatment on an annual basis because of their potential to re-establish from a seed bank or re-colonize from outside populations through wind or bird dispersal of seed. English hawthorn is widely scattered through the site, and out treatments to date have focused on specific habitats or locations. Himalaya blackberry is the most ubiquitous and problematic non-native species on the site, and it may be that biocontrol will be the only solution to its infestations. Our primary strategy for this species is to target treatments that are relatively cost efficient (primarily mowing, and hand clipping by volunteers) and are focused on priority habitats. These treatments do not kill the blackberry, but reduce its spread and reduce its ability to displace desired native plant species. We have focused blackberry removal in the upland prairie habitat, where we have treated (mostly through mowing) a total of about 64 acres of habitat.

Objective 1, Task b - Reduce adult bullfrog populations by 50% from pre-control levels.
Methods - The primary means we are using to reduce bullfrog populations is removal of egg masses during the breeding season. In some years when water levels get low, we can supplement this approach with the removal of tadpoles as they become concentrated in small pools.

Results, successes, and failures: The results of our efforts to reduce bullfrog populations are summarized in the graph in Figure 1, which shows numbers of bullfrog larvae trapped in the same

portions of the site in 1996, 1998, 1999, 2000, and 2001. These results to a large extent reflect our efforts to regularly remove egg masses from potential bullfrog breeding areas. However, in 1999 we also had the opportunity to divert excessive summer water flows that came from an office park development located upstream in the watershed. Due to this action, as well as a series of relatively dry summers (and near record drought in 2001), habitat conditions that are optimal for bullfrogs (year round presence of large bodies of open water) have been limited on the site since 1999. The concentration of bullfrog tadpoles in small areas of open water during the dry season has also facilitated more efficient trapping efforts. We recognize that bullfrogs are still present in the system, and their numbers could recover to pre-treatment levels, either by lack of continued management, or by immigration into the site from other suitable habitats nearby.

Objective 1, Task d - Enhance three acres of oak woodland by reducing trunk density and removing non-native understory vegetation. **Methods -** Enhancement would be accomplished by reducing trunk density and removing invasive non-native understory vegetation, particular Himalaya blackberry. This would increase the structural diversity and productivity of the oak woodlands for target wildlife species. Remaining oaks would be provided with greater space for canopy development, while girdled and felled trunks provide standing and down coarse woody debris for wildlife use.

Results, successes, and failures: This habitat only covers a relatively small area of the site, but is and important habitat for both plant and wildlife diversity. Out initial amphibian inventories identified the oak stand as an important summer habitat for rough-skinned newts. We have only been working on enhancement of this area task since 1999. We are monitoring our progress through photomonitoring, tracking individual tagged treated trees, and plant inventory (but not quantitative vegetation monitoring). In addition, we established a breeding bird point count station in 2001. This is a long term effort to gradually shift the structure and composition of the stand toward desired conditions, which can be summarized as reduced conifer density, increased size and canopy area of dominant oaks, and increased abundance of native herbaceous species in the understory. We have found mowing of the blackberry thickets in the understory, as well as hand removal of conifer saplings and invasive shrubs, to be an effective way to enhance the vigor of pre-existing native understory plants. This will hopefully lead to larger populations as natural reproduction increases. Gradual thinning of the relatively dense oak overstory, and removal of conifers, should, over time, increase the abundance of nest cavities in trees, and improve habitat for oak associated wildlife such as acorn woodpecker and white-breasted nuthatch.

Objective 1, Task e - Restore eight acres of invaded wet prairie to wet prairie and ash savanna habitats.
Methods - Work crews will be hired to use chain saws to manually remove invading woody vegetation (mostly common pear and Oregon ash) that has invaded open prairie habitat. This work will be done in late summer and early fall when impacts to the existing habitat are minimized.

Results, successes, and failures: Since 1996, we have restored five to ten acres of" invaded wet prairie" (former wet prairie in which hardwood saplings have become established due to fire suppression) per year, for a total of about 40 acres over the entire time period. Figures 2 and 3 are air photos from 1992 and 2001, which show the extent of the areas where invading woody vegetation has been treated. Figure 4 shows an area of wet prairie from a single permanent photo station during four different years. Restoration has involved both manual removal of woody vegetation (which has been hauled off-site) as well as implementation of prescribed fire with burns done various sized units in 1996, 1998, and 2001. We believe that the restoration work has benefited the wet prairie native plant community and at-risk/T&E plant species by preventing ecological succession that would result in their eventual elimination from the habitat. We have performed quantitative plant community monitoring in these wet prairie habitats, both before and after management treatments. Although results have varied from species to species, and from year to year, an assessment of monitoring data from 1993 through 2000 (Jancaitis 2001) found that more native plant species than non-native species showed significant increases in response to management treatments (woody vegetation removal and prescribed fire). In addition, more non-native species than native species showed declines in response to management treatments. Figure 5 shows graphs of yearly monitoring data for two plant species, one native (which

has generally increased in response to management treatments) and one introduced (which has decreased in response to management treatments). It should be noted, however, that there are some non-native species (such as colonial bentgrass) that have increased in response to our management treatments, and coming to terms with such mixed results is one of the challenges of our restoration efforts.

A variety of wildlife observations have been done in the treated areas. For example, we have undertaken time constrained searches of prairie habitat immediately following prescribed burns to determine extent of mortality to animals (few dead animals have been found), and we have established a point count station for breeding bird monitoring in the main restored wet prairie area. In recent years, western meadowlarks have been more numerous in areas where woody vegetation has been removed. In the spring following the 1998 burn, a Lewis' woodpecker was observed for several weeks foraging within the burn unit.

Objective 1, Task f - Restore native grasses and forbs to establish one acre of native upland prairie on former agricultural land.
Methods - This task will involve site preparation to eliminate existing non-native vegetation, collection or propagation of native grass and forb seed, and planting of one acre of former agricultural land.

Results, successes, and failures: We only began work on this task in 1999. To date, we have restored approximately 1.8 acres of previously non-native vegetation to upland prairie, by site treatment and planting of a diversity a upland prairie grasses and forbs. We have successfully established native bunchgrasses such as Roemer's fescue, as well as native prairie forbs important to the Fender's blue butterfly. In 2001, we observed the eggs of the federally listed Fender's blue butterfly on the leaves of Kincaid's lupine plants that we had planted the previous spring. Upland prairie restoration is extremely challenging

Objective 1, Task g - Install and monitor "soft" erosion control methods on streambanks and at nickpoints.
Methods - Willow stakes and bundles, and straw pillows contained within jute netting, will be installed to stabilize localized occurrences of bare stream banks and eroding stream channels.

Results, successes, and failures: *We have undertaken stream channel stabilization projects at several places on the site. The highest priority problem area identified in a report we commissioned from a contract hydrologist was a head cut on the main west fork of Willow Creek. This problem area was addressed in 1999 in conjunction with a City of Eugene road project. TNC staff worked with City engineers to design the elevations of a new stream crossing along West 18th Avenue to match conditions that existed prior to the initiation of the head cut event. The city also funded work to bring the eroded streambed back up to the original bed elevation, and re-vegetated the area with native grasses and willows. The other areas we have treated have been located on smaller tributaries to Willow Creek, and our objective was generally to stabilize conditions, not restore previous conditions*

Objective 2 –Monitor and evaluate invasive and non-native species control activities.

Objective 2, Task a – Implement monitoring and evaluation of invasive and non-native species control activities. Both quantitative and qualitative methods are used to monitor invasive species control efforts. In wet prairie habitat, a series of permanent vegetation monitoring plots have been established, and data on plant species abundance are gathered annually. In addition, an extensive series of permanent photo stations has been established to visually document changes in habitats undergoing active management.

Results, successes, and failures: Our monitoring of treatment of invasive and non-native vegetation is being done through a variety of methods. These include air photos (the City of Eugene has a flight taken every year), which we use to quantify areas treated and map populations of target invasive species;

permanent photo stations which are also taken yearly,; and in certain habitats, annual quantitative vegetation monitoring. Reference to these various types of data have been made above.

Objective 3 - Monitor hydrology and water quality conditions to compare with baseline conditions regarding stream flows and water quality inputs to the Willow Creek site.

Objective 3, Task a - Monitor hydrology and water quality conditions.
Methods - Ensuring that suitable hydrologic conditions are maintained is important to maintaining and improving wetland and aquatic habitats for wildlife. Under this task we will monitor a series of groundwater wells to document groundwater patterns, and six staff gauges to document changes in water levels in beaver ponds. We also will gather baseline data on stream flows (stage measurements) by installing an automated device at one location on the site. The flow data will be used to document baseline conditions, and to calculate loadings of any pollutants that are detected in water quality monitoring. Much of the data gathering and data analysis will be performed by students at Churchill High School, which is located about 1 mile from Willow Creek.

Results, successes, and failures: For the most part, the data gathered to date have helped to establish baseline conditions at the monitoring stations. Since there is inherent natural variation from year to year, the longer the term record, the better the ability we will have to detect changes or trends. We have been gathering precipitation, turbidity, and staff gauge data for the longest time period, (5+years), and groundwater well data for three years. We have had difficulty getting our gauging station located and established but that should be up and running soon. In addition, other partners, such as the city of Eugene, the Long Tom Watershed Council and students from Churchill High School (located nearby) have also been gathering basic water quality data. In general, water quality in Willow Creek is relatively good, but we have used turbidity data to identify several problem areas upstream from our property and have used the data to develop responses.

Objective 3, Task b - Continue precipitation monitoring.
Methods - We will use an automated rain gauge to document precipitation during the project period. Because the nearest official rainfall measurement station is located 10 miles away, and because precipitation varies locally depending upon variations in topography, we believe it is important to have a local precipitation record to use for calculating and modeling stream flows under alternative future land use conditions.

Results, successes, and failures: See above.

Objective 3, Task c - Continue turbidity monitoring.
Methods - We monitor turbidity at least twice a month at a series of eight sampling locations. Measurements are made with an Orbeco-Hellige Model 966 portable turbidimeter.

Results, successes, and failures: See above.

Objective 4 – Monitor selected target wildlife species to document wildlife use and promote and adaptive management approach to habitat restoration.

Objective 4, Task a – Monitor response of selected wildlife species to prescribed burning and other management actions.
Methods – A variety of techniques, including time constrained searches, point counts from permanent monitoring stations, and qualitative observations, will be implemented to gauge the response of wildlife species to habitat changes in areas under active management. If the above monitoring indicates that there are certain on-site problems related to hydrology or aquatic habitat conditions, we will use an adaptive management approach to revising and updating management and enhancement activities.

Results, successes, and failures: Species specific wildlife monitoring has focused on either particular species/species groups of interest (such as the endangered Fender's blue butterfly, or breeding birds), or responses to management treatments such as prescribed fire. Some of these examples have been described above. Figure 5 shows data from monitoring of the Fender's blue butterfly. This species tends to vary widely from year to year depending upon weather conditions, but it does appear that there is a general upward trend that is related to implementation of habitat management and invasive species removal.

Objective 5 - Improve defensibility of the site and reduce unauthorized use and associated impacts.

Objective 5, Task a - Continue volunteer defensibility monitoring
Methods - Volunteers make monthly visits to a set route on the site, and record observations of visitor use, changes in hydrology, wildlife sightings, and plant phenology. These observations are useful for documenting coarse level changes and patterns on the site.

Results, successes, and failures: We have maintained a volunteer site monitoring program that involves 6 to 14 individual volunteers making monthly site visits. The volunteers have provided between 75 and 150 site visits per year over the last 6 years. The role of this program in our management efforts is in part to identify management issues that might not be observed immediately by staff. The reports these volunteers provide also help us to track levels of visitor use, and they assist with gathering of staff gauge data.

Objective 5, Task b - Maintain or update public use signage and entry controls (gates and fences) as necessary.
Methods - Limited amounts of wear and tear as well as vandalism require that we replace signage and entry controls from time to time. This ensures that we are able to protect habitat quality from disturbance related to unauthorized uses of the site as best possible.

Results, successes, and failures: Repair and maintenance of signage and gates is a constant effort, but in general we have not had great problems at the site with vandalism or inappropriate use.

Figure 1

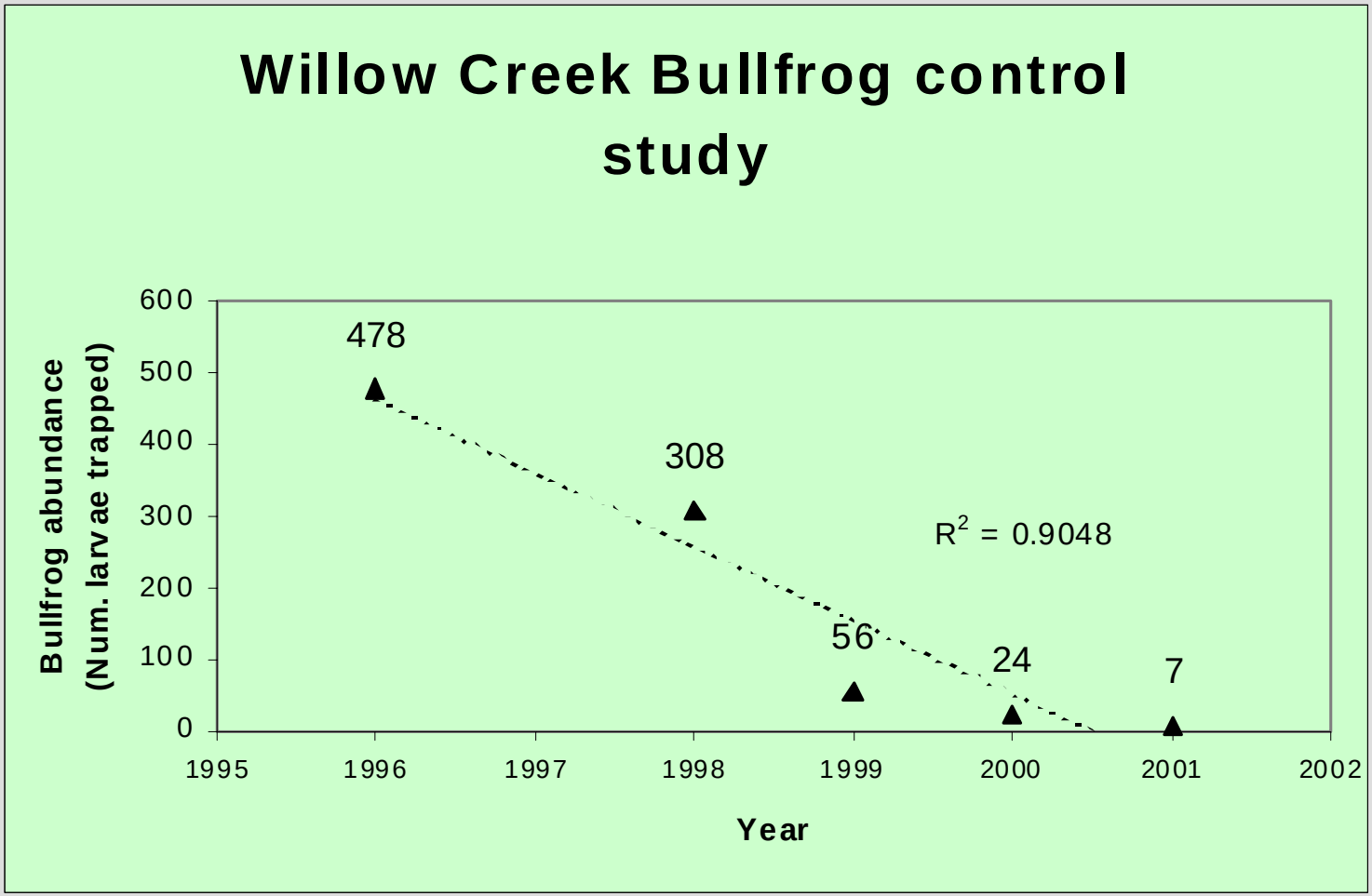

Willow Creek Bullfrog control study
Bullfrog abundance (Num. larvae trapped)
600
500
400
300
200
100
0
478
308
56
24
7
R2 = 0.9048
1995
1996
1997
1998
1999
2000
2001
2002
Year

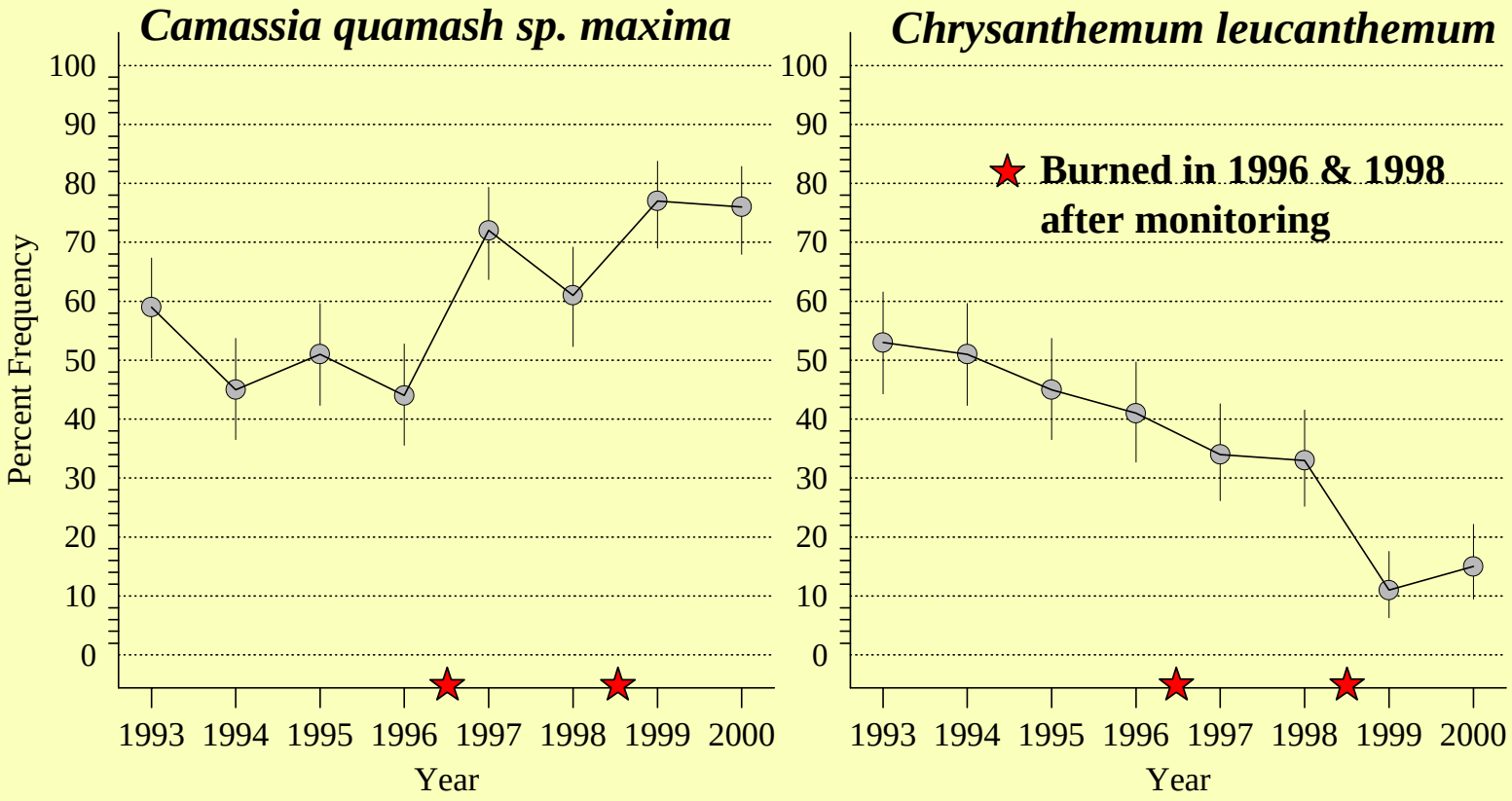
Figure 4

Figure 5

Percent Frequency Data for Willow Creek, 1993-2000

Frequency Estimates at 0.01 m² with Binomial 90% CI

Macroplot 7



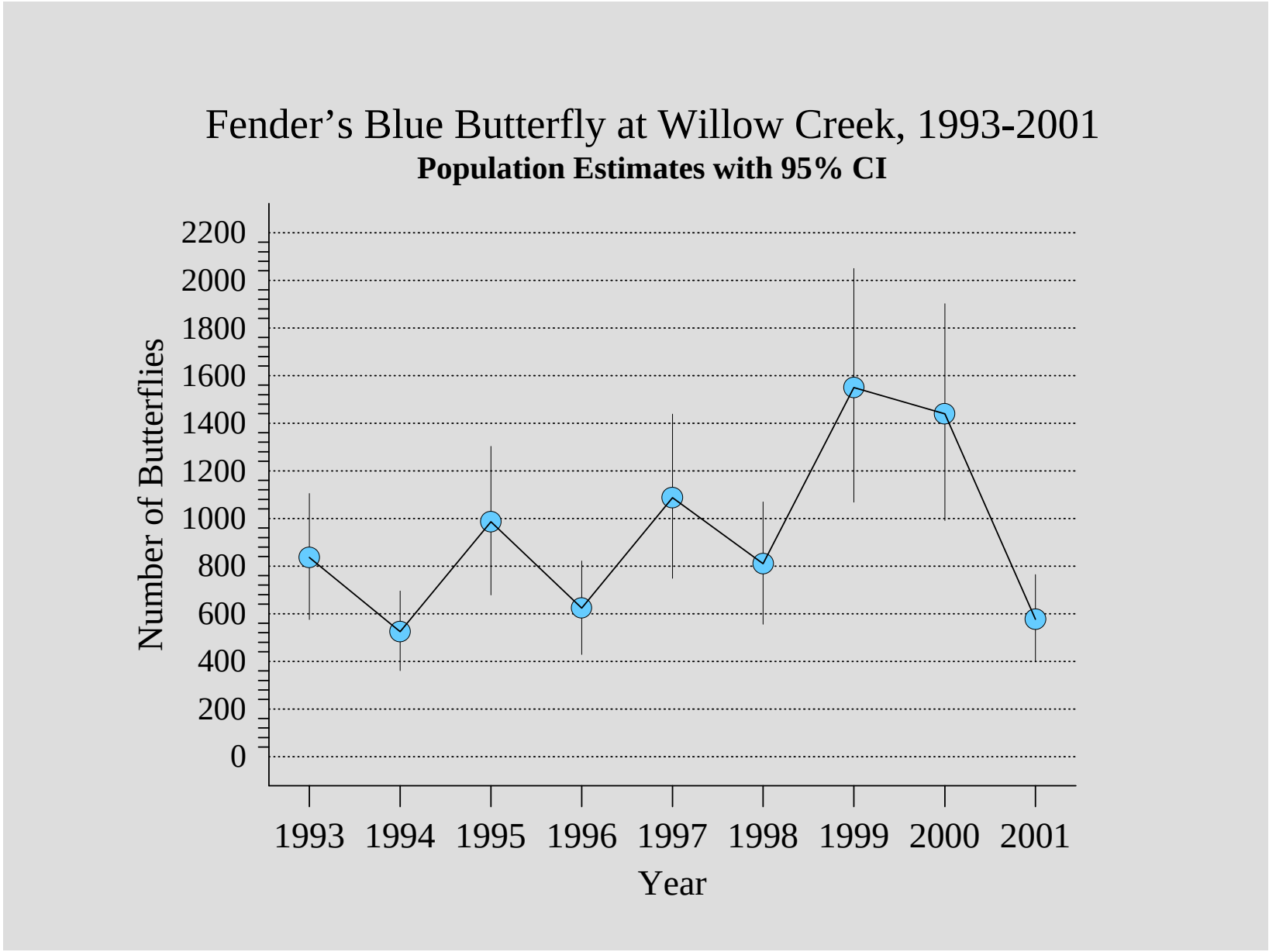

Fender's Blue Butterfly at Willow Creek, 1993-2001
Population Estimates with 95% CI
Number of Butterflies
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1993
1994
1995
1996
1997
1998
1999
2000
2001
Year

Figure 6

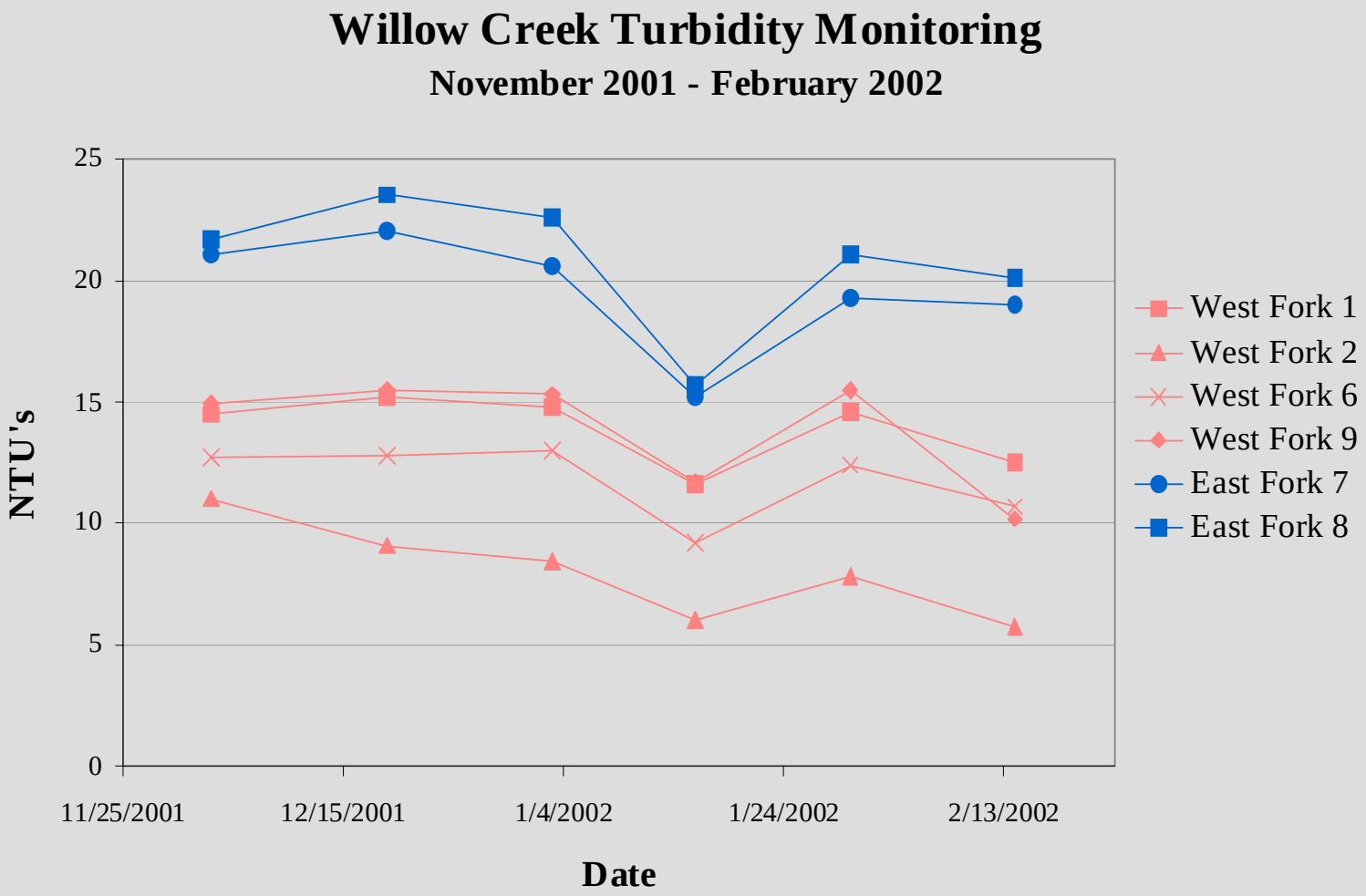
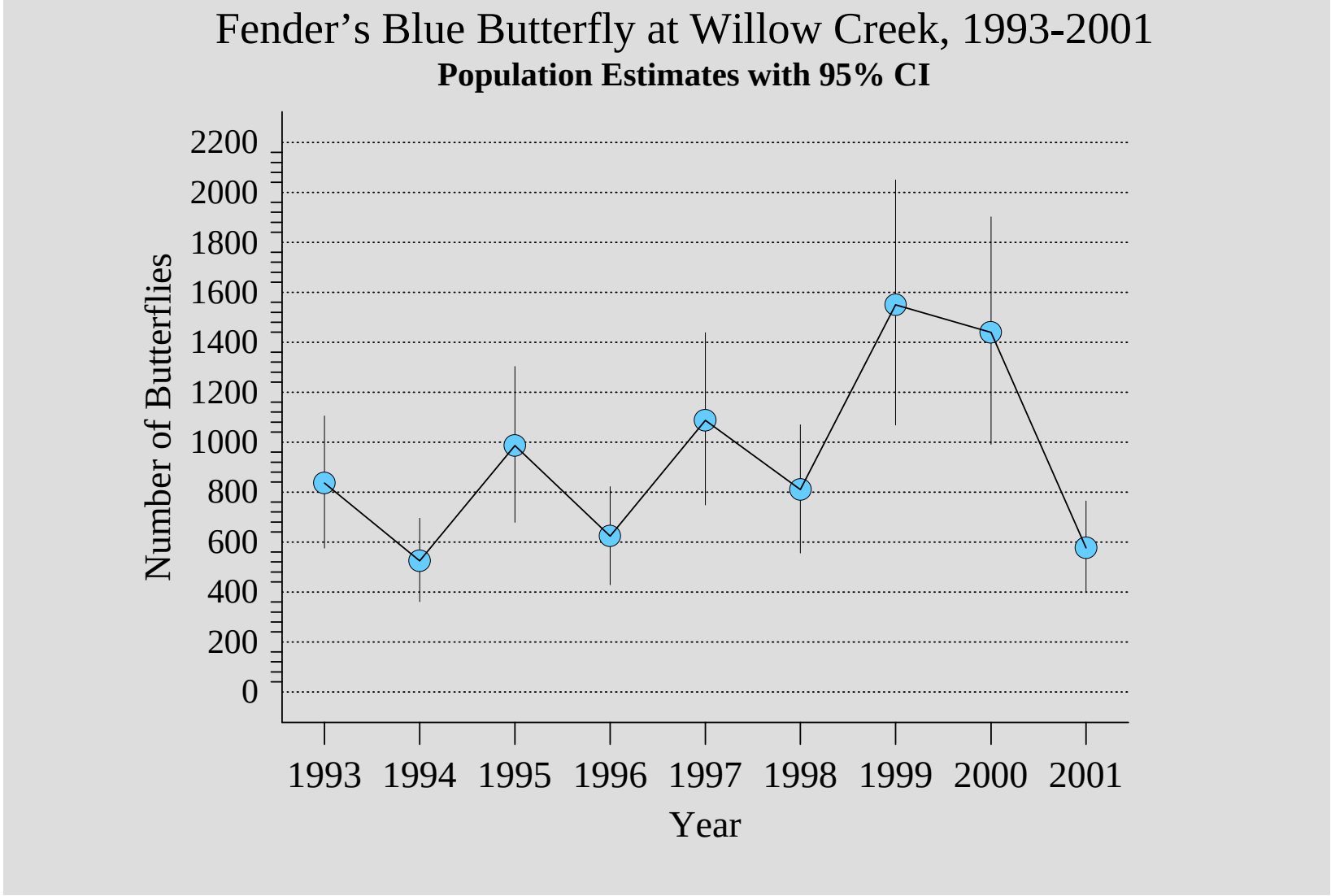

Willow Creek Turbidity Monitoring
November 2001 - February 2002
NTU's
25
20
15
10
5
0
11/25/2001
12/15/2001
1/4/2002
1/24/2002
2/13/2002
Date
West Fork 1
West Fork 2
West Fork 6
West Fork 9
East Fork 7
East Fork 8

Figure 6


Fender's Blue Butterfly at Willow Creek, 1993-2001
Population Estimates with 95% CI
Number of Butterflies
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1993
1994
1995
1996
1997
1998
1999
2000
2001
Year