

9.0 WATERSHED BASED *ARUNDO* CONTROL PROGRAMS: RECOMMENDATIONS, STATUS, AND PRIORITIZATION

9.1 Recommendations and Status of Watershed Based *Arundo* Control Programs

Given *Arundo*'s dependence on asexual propagation (it only spreads from fragments of plant material), control programs that start at the top of watersheds are undoubtedly the most efficient and effective over the long-term. Most watershed-based programs start on the upper portions of rivers and tributaries and proceed downstream to the ocean outfall. Many programs do not control all scattered infestations, such as those occurring in urbanized areas, particularly if these properties are not directly connected to drainages, creeks, or rivers. More comprehensive programs do attempt to eradicate all *Arundo* within the watershed, as any material is potentially a propagule source. Yard waste that is disposed of improperly, such as dumped along roads or creeks, is a pathway of spread. Once a watershed has had all *Arundo* controlled there is still a need to remain alert for new introductions that can occur from other watersheds as: contaminated fill, yard waste, or intentional planting of *Arundo* (even though it is a CDFA listed Noxious Weed, B rated).

General goals of control programs should be the following, but there are site-specific exceptions to these statements:

- Control programs should attempt to achieve eradication on entire watersheds, as this is the most efficient use of limited resources.
- Control programs should start in upper watershed areas and proceed downstream. This is more important on large, highly invaded watersheds that may require 10–20 years to carry out implementation. Small watersheds, or those large watersheds with little acreage, can be treated in any 'order' as long as everything is treated over a reasonable time frame.
- Programs frequently implement control projects in defined sub-sections of the watershed. The program still proceeds from the upper, to the middle, and then the lower watershed as different sub-sections are completed. Within a section, control may occur 'out of order'. This can be beneficial (fuel breaks, creating a mosaic of age classes for restored areas, multiple classes of property ownership, etc.) and is often done intentionally.
- Programs should strive to achieve 100% control within project areas. This is a difficult objective and requires both long-term commitment and substantial tracking. Most *Arundo* is controlled after 5–10 years of work, but re-sprouts will occur, particularly if project areas are large. Areas need to be checked and re-treated for 20 years to assure 100% control. Control and surveying may occur at three-year intervals for older project areas.
- Some highly invaded watersheds may have high-value habitat areas that need or require restoration or *Arundo* control before the larger program has 'reached' the area. These activities may be warranted, even though significant untreated *Arundo* remains upstream. Projects should budget periodic treatment of new *Arundo* invasion onto the property. Re-invasion of a given property is difficult to predict and would be dependent on geomorphic position, amount of *Arundo* upstream, and periodic flow events that mobilize material. Historic review of systems indicates that invasion is very episodic for the most part, and that responding after very large events will be the primary task.
- Watersheds with active programs may prioritize areas for control that have burned. Fires temporarily clear biomass from a site, representing an excellent opportunity for inexpensive

control as biomass reduction or removal is often the most expensive component of a control project.

9.1.1 Entity/Group Leading Watershed Based Work

For a watershed-based control program to succeed it typically needs either a single lead entity or an organization that brings together multiple partners. Larger watersheds without a lead entity or formal coordination have been unable to implement meaningful watershed-based *Arundo* control. There are five main reasons why a program lead is needed: funding, permitting, contracting, permission through right-of-entry agreements (ROEs), and long-term presence. Groups that are unable to receive public funds, hold permits, obtain ROEs, and garner broad support among watershed stakeholders should not attempt to lead projects or programs. Control programs on watersheds with more than 50 acres of *Arundo* or *Arundo* on more than 100 properties will likely only succeed if a program with an identified lead entity exists.

Table 9-1 identifies the specific watershed program leads within the study area. Most larger watersheds with high levels of *Arundo* invasion have already formed watershed based groups to initiate work. There are multiple types of organizations that can function as a lead. Most groups are public entities such as County Departments, Resource Conservation Districts (RCDs), and Joint Power Authorities (JPAs). But it is possible for a non-profit to function as a watershed lead (Carlsbad: San Elijo Conservancy, Tijuana: SWIA). Appealing to a broad range of landowners is a strong benefit, particularly in areas with a mix of private and public landownership. Resource Conservation Districts (RCD's) are frequently leads (Mission, Monterey) or active participants in stakeholder groups (SAWA: RCD's and water districts). Weed Management Areas or WMAs (typically formed by County Agriculture Departments or RCDs) can also play an important role in implementing projects and building watershed control programs.

9.1.2 Status of Permitting Allowing Work to Occur

Watershed programs seeking to control *Arundo* are required to obtain regulatory clearance from multiple agencies. Permits and conditions are dependent on methods being used to control *Arundo*. Typically this includes:

- CEQA: generally Mitigated Negative Declaration, Negative Declaration, or Notice of Exemption. EIRs are rarely required. This can take anywhere from 1-12 months to process depending on the path taken.
- Department of Fish and Game Streambed Alteration Permit 1600: nearly always required. This process can take one month to over a year long and CEQA should be completed first.
- U.S. Fish and Wildlife Service: Section 7/10 or a Technical Assistance Letter may be required if federally listed species are present. If take or harassment is likely to occur, a Section 7/10 is required and this can take 6-12 months or longer. If endangered species are present but impacts can be avoided, a Technical Assistance Letter can be used to outline protective measures. This can be completed in one to three months.
- Two other agencies also regulate protected species: California Endangered Species Act (under CA Department of Fish and Game) may require concurrence with U.S. Fish and Wildlife Service agreements/protective measures and National Marine Fisheries Service (under the National Oceanic and Atmospheric Administration) may require consultation.

Table 9-1. *Arundo* control programs within the study area: program leads, status of permitting and work completed on each watershed.

Watershed Unit	Total net acres	Treated net acres	Percent treated	Group leading control program	Watershed-based permitting completed	Notes
Calleguas	229	2	1%	No clear lead, multiple partners	CEQA	Ventura RCD and County active, but few projects completed to date
Carlsbad HU	148	98	67%	San Elijo Lagoon Conservancy, San Diego Co	CEQA, DFG 1600, FWS, ACOE	Well established program (2002), strong implementation
Estero Bay	10	1	12%	San Luis Obispo County Ag Dept.	Project based	Work is project by project
Los Angeles River	131	16	12%	None	Project based	Work is project by project
Otay	19		0%	None	None	
Pajaro River	8		0%	None	None	
Penasquitos	23	2	9%	None	Project based	Work is project by project
Pueblo San Diego	15		0%	None	Project based	Work is project by project
Salinas	1,332	106	8%	Monterey RCD	CEQA, DFG,&FWS in process (& existing project based)	Project based but moving toward formal watershed-based program
San Diego	150	56	38%	San Diego River Conservancy	CEQA, DFG 1600, FWS, ACOE 404, SWCB 401	Newer watershed-based program (2009), rapid implementation
San Dieguito	175	90	51%	San Dieguito JPA	CEQA, DFG 1600, FWS	Well established watershed-based program (2006), rapid implementation
San Gabriel River	44	8	19%	None	None	Work is project by project
San Juan	173	13	8%	County of Orange	CEQA, DFG 1600, FWS, ACOE 404, SWCB 401	Newer watershed based program (2009), little implementation to date
San Luis Rey	684	612	90%	Mission RCD	CEQA, DFG 1600, FWS, ACOE 404, SWCB 401	Well established program (2000), strong implementation
Santa Ana	2,534	1,007	40%	SAWA	CEQA, DFG 1600, FWS, ACOE 404, SWCB 401	Well established program (1992), strong implementation
Santa Clara	1,019	1	0%	No clear lead, multiple parties	Some permits for LA County, none for Ventura County	Poorly formed program, no clear lead, low levels of implementation

Watershed Unit	Total net acres	Treated net acres	Percent treated	Group leading control program	Watershed-based permitting completed	Notes
Santa Margarita	689	685	99%	Lower: USMCB Camp Pendleton, Middle: Mission RCD, Upper: none	Lower and middle: NEPA/CEQA, DFG 1600, FWS, ACOE 404, SWCB 401 Upper: none	Well established program (1995), strong implementation- but no clear upper watershed lead
Santa Monica Bay	19	1	2%	None	None	Work is project by project
Santa Ynez	6		0%	Santa Barbara County Ag Commissioner	In Process: CEQA, DFG 1600	Newly forming project (2010)
South Coast	30	8	26%	Multiple parties: County, Cities	Project based	Work is project by project: some watershed units far along, some just starting
Sweetwater	42	6	14%	Sweetwater Authority	Project based	Work is project by project
Tijuana	131	41	31%	Southwest Wetlands Interpretive Assoc. (SWIA)	Project based	Work is project by project- constrained by <i>Arundo</i> in Mexico, true watershed-based management may not be possible on lower watershed
Ventura River	250	117	47%	County of Ventura	CEQA, DFG 1600, FWS, ACOE 404, SWCB 401 (project based, but for large sections of watershed)	Well established watershed-based program (2008), rapid implementation
Totals:	7,864	2,862	36.4%			

- Army Corps of Engineers 404 permit may be required for larger control programs using heavy equipment. In Southern California (San Diego up to San Luis Obispo County), a Regional General Permit 41 has been issued for *Arundo* and other non-native plant control programs. This permit, when activated for a specific program or project, fulfills both ACOE 404 permitting requirements and SWCB 401 certification. Completion of the ACOE RGP 41 application process can occur in less than three months. ACOE 404 certification without use of RGP 41 is an open-ended process.
- State Water Control Board or Regional Water Quality Control Board 401 certification or discharge permits can be required for programs depending on methods and equipment used. If obtained under ACOE RGP 41, the process is fast (under a month). If obtained as a 401 certification or discharge permit, the process is open-ended.
- Coastal Commission Permit may be required for certain projects. Exemptions have been obtained for some programs deemed to be restoration. Permitting process is open-ended and typically is the last permit completed.
- Other permits: additional project or watershed-specific permits may be required. This may include California State Historic Office (notification and/or compliance) and municipal or county codes/permits.

The number and complexity of regulatory permits for carrying out *Arundo* control makes it imperative that program leads are familiar with navigating the permitting process and that efficient and competent management of programs and permitting requirements is occurring. Given the number of permits that are required for larger programs, it is of substantial benefit if watershed-based permits can be obtained. Each watershed is identified in Table 9-1 as to the type of permits that are held and programs in place (whether it is watershed or project based). Additionally, *Arundo* control is a long-term process, with projects lasting at least five years and control typically taking 10-15 years. Programs on larger systems may take 15-20 years to complete all initial control. For this reason, obtaining the longest duration permits (particularly for DFG 1600) is the most efficient use of resources, even though these permits cost more initially.

Funding agencies and mitigation programs frequently will not fund projects that have permitting 'in process' or projects that expect to obtain permits after being awarded funding. Having approved and active permits in place from all required regulatory agencies is a primary indicator of a program's ability to execute on a specific project.

9.1.3 Work Completed to Date

Experience and track record of a watershed control program are the best indicators of a specific group's ability to complete projects in a time-efficient and cost-effective manner. Program leads typically are in charge of selecting work areas, obtaining ROEs, obtaining and complying with permits, obtaining funding, and selecting and contracting with groups to carry out the work. These factors are usually well documented in grant and other funding applications, and it is beyond the scope of this report to evaluate successes and failures of specific programs. Table 9-1 does, however, indicate which watersheds have well-established programs, when they started, and the treated acreage. Many of these programs actively participate in sharing information on control methods, mapping methods, permitting approaches, public outreach and other information. The community of control programs across the state is, in general, open and supportive of each other.

9.1.4 Future Program Work

Programs should use mapping data to demonstrate that top-down control is occurring by indicating what has been controlled, what is proposed, and what is planned. Programs should also use high-resolution mapping of *Arundo* stands to calculate budgets presented in proposals and for tracking treated acreage in mitigation programs. The mapping completed for this study and presented in this report represents high-resolution data.

Some programs appear to be vastly over-inflating acreage of *Arundo* stands in their proposals, work plans and mitigation programs. This may not be intentional, but it is misleading, particularly when making comparisons between watersheds or even proposals within a watershed. One example of misrepresentation occurs when gross area is used in place of net area. For example, a 200 acre site that has 15 acres of *Arundo* stands scattered within it should not be characterized as '200 acres of *Arundo* control'. If there are large expanses of native vegetation within areas designated as 'Arundo project acreage', it can be a clear indication of questionable mapping. This overestimation can easily be detected if the mapped elements are viewed over high-resolution aerial imagery.

Maps presenting project acreage with point and line data can also be particularly suspect, especially if *Arundo* acreage is high. Additionally, maps with large polygons covering long lengths of river from terrace to terrace are questionable. Even in the most invaded portions of highly invaded systems, *Arundo* rarely achieves cover greater than 50% for long lengths of river. The mapping data presented here allows general verification of mapping presented in proposals. Mapping with acreage levels that are within 20 to 30% of this study's acreage is most likely accurate. A large difference in *Arundo* acreage compared to this study's mapping may indicate that a different methodology was implemented (i.e. coarse mapping with low *Arundo* cover) or mapping protocols were of poor quality. Other clues to either a poor understanding of implementation costs (\$10-30,000 per acre for a typical project), or mapping that is not accurately representing *Arundo* acreage, can appear in proposed project budgets. For example, projects outlining control of 100 acres of *Arundo* for five years cannot reasonably cost \$150,000. It is recommended that future proposals and plans be evaluated to determine if they accurately represent *Arundo* acreage.

9.2 Priority Ranking of Watershed-Based *Arundo* Control

9.2.1 Factors Considered in Ranking: Impacts and Capacity

Ranking watershed programs is a complicated and potentially subjective exercise. Multiple impacts from *Arundo* invasion have been outlined in this report. Some impacts are directly tied to the level of invasion (geomorphology, flooding, fire and water use), while other impacts are tied to specific species co-occurring with *Arundo* (listed species). While different weightings could be used for each factor, this analysis will weigh all factors as equal. Active watershed groups are also assessed in terms of their ability to initiate and complete work (functioning lead entity, completed permits, past execution). A ranking or evaluation of each program's quality of execution was not performed for this assessment.

Watersheds with small amounts of *Arundo* will tend to rank low in the impact assessment, yet these areas may be among the most efficient to treat in terms of preventing future degradation. This will be discussed at the end of the section.

9.2.2 Control Priority

Overall there are three priority actions for funding of *Arundo* control:

- 1) Fund re-treatments of project areas that have already implemented watershed-based control. This protects the existing investment.
- 2) Fund control of *Arundo* on watersheds with low levels of invasion. It is more cost efficient to control *Arundo* before it becomes abundant.
- 3) Fund new control on invaded systems, but prioritize where watershed-based programs/ approaches are being used, and where benefit is greatest. Funding is finite, so efficient use of limited resources should occur.

Re-treatment of *Arundo* within established program areas is the highest priority. The fact that *Arundo* was abundant at these sites prior to control work indicates that these areas have the capacity to support re-establishment of large infestations if left unfinished. Over \$70 million has been spent to date on well-established *Arundo* control programs within the coastal watersheds in the study area. Five watersheds have controlled a significant portion (>80%) of the *Arundo* found on their watersheds: Carlsbad HU, San Luis Rey, Santa Ana, Santa Margarita, and Ventura. Maintaining and completing *Arundo* control on the portions of these watersheds treated to date is highest priority. For the most part, funding and management agencies have recognized this and provided funding for re-treatments (years 5 to 20). Continued long-term funding support is needed for re-treatments to achieve true eradication of *Arundo* within these program areas.

Control of *Arundo* on watersheds with low levels of invasion is the next priority. Some watersheds have low levels of *Arundo*, most likely due to more recent introductions. Control of invasive plants early in the invasion process is always more cost effective than responding to a larger, more widespread invasion. Programs should be able to control *Arundo* on many of these smaller populations (Santa Ynez, Estero, Pajaro, and others) with less complicated permitting and low project implementation costs. Treated *Arundo* biomass can often be left standing if it is scattered, also greatly reducing treatment costs.

Funding *Arundo* control on more invaded watersheds should target watersheds experiencing the most severe impacts coupled with the highest likelihood of achieving success. These rankings are based on impacts caused by *Arundo* invasion (four classes) and program capacity (two classes, Table 9-2). This ranking approach is biased in that it selects for watersheds that have moderate to high levels of *Arundo*

invasion (due to correlation of impact level and invasion level). Watersheds with low levels of invasion have already been recognized as being of 'high value' for control, even though few impacts may currently be occurring. It should also be noted that the impact classes reflect the magnitude of *Arundo*'s effect on the watershed, not the importance of the impact issue. For example, groundwater recharge and water savings may be a significant issue on a watershed that scores a 0. This low ranking reflects the low *Arundo* acreage, and corresponding level of impact, but not the importance of water savings on the watershed. Table 9-2 provides guidance in assigning priority among the more invaded watersheds, which may be of use. High ranked watersheds are experiencing severe impacts and have the capacity to implement control. Watersheds with high acreage in the medium class may provide less return on investment in terms of impact reduction.

Programs/projects that do not fit into a watershed-based control program should be evaluated carefully. There are situations where control of *Arundo* at a downstream site can make sense. For instance, control may help protect structures and restore important habitat, or the entity owning the land may have the resources to initiate work. These sites are, however, at significant long-term risk of re-invasion. Funds should be set aside to respond to re-invasion, which is expected to be periodic and varying in intensity. Projects that merely reduce *Arundo* biomass or only carry out one treatment are not effective long-term control projects, and should not be presented as such.

Table 9-2. *Arundo* treatment priority ranking by watershed. Based on *Arundo* impacts and program capacity.

Watershed Unit	Total Net Acres	Percent treated	Group leading control program	Arundo Impacts				Capacity		Total	Priority ranking
				Water Use	Geo-morph	Fire	Listed species	Exp. lead	Per-mits		
Santa Ana	2,534	40%	SAWA	5	5	5	5	5	5	30	Very high
San Luis Rey	684	90%	Mission RCD	4	5	5	5	5	5	29	
Santa Margarita	689	99%	Lower: USMCB Camp Pendleton, Middle: Mission RCD, Upper: none	4	5	4	5	5	5	28	
San Dieguito	175	51%	San Dieguito JPA	5	2	4	4	5	5	25	
Ventura River	250	47%	County of Ventura	3	4	5	3	5	5	25	
Santa Clara	1,019	0%	No clear lead, multiple parties	5	4	5	5	1	3	23	High
San Diego	150	38%	San Diego River Conservancy	4	2	4	3	4	5	22	
Salinas	1,332	8%	Monterey RCD	5	5	2	3	3	3	21	
Carlsbad	148	70%	San Elijo Conservancy, S.Diego Co	2	2	2	3	5	5	19	
San Juan	173	8%	County of Orange	2	3	3	3	3	5	19	
Tijuana	131	31%	SWest Wetlands Interpretive Assoc.	2	2	2	2	4	4	16	Medium
Calleguas	229	1%	None	3	3	4	2	1	2	15	
Los Angeles	131	12%	None	2	1	3	4	2	2	14	
Calleguas	229	1%	None	3	3	4	2	1	0	13	
Santa Ynez	6	0%	Santa Barbara County Ag Dept	0	1	1	3	5	3	13	
Sweetwater	42	14%	Sweetwater Authority	1	2	2	3	3	2	13	
San Gabriel	44	8%	None	1	1	2	4	2	2	12	
South Coast	30	26%	Santa Barbara County Ag Dept	0	1	2	3	3	3	12	
Santa Monica	19	2%	None	0	1	2	4	2	2	11	
Otay	19	0%	None	0	1	2	2	3	2	10	
Estero Bay	10	12%	None	0	0	0	2	3	3	8	Low
Penasquitos	23	9%	None	0	1	2	3	1	0	7	
Pueblo San Diego	15	0%	None	0	1	2	1	0	0	4	
Pajaro River	8	0%	None	0	0	0	2	0	0	2	
Totals:	7,864	36.4%									