Future research needs for invasive plants (Friday October 3, 2008)
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Help set the research agenda for invasive plant management in California! Cal-IPC recently prepared a draft of invasive plant research needs for California. We will briefly review the findings and ask for input from workshop participants. The ten research needs areas covered were: Biology and Ecology; Distribution, Biogeography and Range Modeling; Ecological Impacts; Control and Management Methods; Restoration; Human Activities Affecting Invasion; Economic Impacts; Social Issues; Risk Assessment; and Policy and Laws. We will also discuss research funding opportunities.

A series of posters were put on the walls with research categories and corresponding issues written on them. After a brief discussion, attendees were encouraged to add to the posters and rank the importance of the issues using stickers. High numbers of stickers indicates high priority. The posters and priority rankings were discussed after everyone had contributed their comments and stickers to the posters.

Preliminary Discussion: What are the research needs priorities?

- How can managers get access to peer-reviewed journals?
    - the National Parks Service has JSTOR access
    - The most robust way is through a university library or research institute
        - managers can get an 'associate in the experiment station' or other courtesy title and have library access
        - make contacts and the university and find a way to loosely associate
        - courtesy appointments are easy and free to obtain, if one person can get a courtesy title then everyone can have access
    - Yosemite and UC Merced have an established relationship, so some people have access to journal articles
    - NPS can request articles, but it can be tedious
    - Do journals allow Cal-IPC to post abstracts? (This material is typically copyrighted)
- Assessing the research needs document and poster topics
    - some people mixed up exotic and invasive plants
    - comment by Jodie Holt
        - we can't encourage students to do unpublishable research, some of these needs are things Cal-IPC should hire and pay people to do
    - response by Ted Grosholz
        - science and management need to come together to be effective
    - Is our definition of research too broad?
        - some areas are addressable, others no one wants to work on and are not publishable
- What do the stickers added to the posters mean?
    - prioritization
    - start broad and then narrow/define it

    - there is a need for a second filter after the interviews for the research needs assessment: academic vs. policy
        - i.e. CDFA California aquatic invasive species plan
    - the dots should be placed on what is important and then decide what is good for who
        - this is how the state weed plan was developed and there is overlap with this
    - a subcommittee should decide on the top 10 priorities and then decide what is fundable
- The total project timeline is to finalize a draft at the end of the year and post it on the Cal-IPC website

Poster #1: Biology & Ecology 22 dot stickers total

- Synthesis of biology and ecology information (7 dots)
- Seed biology & seed bank dynamics (5 dots)
- Below-ground research (4 dots)
- Genetics and molecular tools – use in taxonomy (3 dots)
- What research is publishable/fundable? (0 dots)
- Application of genetic methods to identify invasive populations, genotypes, cultivars, and hybrids (3 dots)
- Access to scientific literature
- Discussion:
    - what does a synthesis of information mean?
        - a lot of people mentioned this in the interviews
        - how can we find and put all of this information into one place?
    - how would a synthesis of biological and ecological information be funded?
        - use the Local Flora of the British Isles as a model?
    - there is limited interest and funding to use genetics for identifying invasive populations, genotypes, cultivars, and hybrids
        - the general public does not always realize how much work goes into genetic techniques
    - there are a lot of questions about horticultural plants

Poster #2: Ecological Impacts – 39 dot stickers total

- General ecological impacts (9 dots)
- Gather and synthesize data on ecological impacts (12 dots)
- What are acceptable thresholds for invasives? (4 dots)
- Interactions of wildlife and invasive plants (5 dots)
- Which native plants persist in invaded areas? (1 dot)
- How do ecological impacts vary regionally and among communities? (1 dot)
- How do ecological impacts vary with time and space? (1 dot)
- Establish permanent plots to track invasions (4 dots)
- Discussion:
    - acceptable thresholds for invasives is also a social issue

    - impacts need to be evaluated at each threshold
    - what are the impacts of different levels of invasion at each location?
    - these points have been the basis of weed science for hundreds of years
    - it is never economically viable to eradicate weeds in agriculture; it is not sustainable
        - there is a difference between economic and ecological thresholds
        - control is maintaining a level of weeds without them becoming a problem → but a problem for whom?

Poster #3: Distribution, Biogeography, & Modeling – 18 dot stickers total

- General distribution, biogeography, and modeling (3 dots)
- Statewide weed maps (7 dots)
- Easy modeling for land managers (1 dot)
- Collect data to run models (1 dot)
- What are yearly cycles of invasions? (1 dot)
- Time to reproduction for rate of spread
- Resistant habitats (4 dots)
- "One-click" data aggregation for updating (1 dot)
- Discussion:
    - develop standardized data methods for sharing
    - modeling for managers
        - not practical for small land areas
        - by the time the model was validated, it would be a challenge to use it
        - CLIMEX is not an easy model and it's expensive
        - Gina's prioritization model in excel is easier to use
        - someone else could use the model and hand the info over to managers
    - collect data to run models
    - which plants are coming in?
    - which species should we worry about?
    - once a weed map is created, it's already out of date → they require constant updating

Poster #4: Risk Assessment – 27 dot stickers total

- Detection and screening at borders (2 dots)
- Pathways of entry (5 dots)
- Predicting which spread after introduction (2 dots)
- List of plants already introduced with dates (0 dots)
- Evaluate horticulture plants for invasiveness (6 dots)
- Which cultivars are invading? (4 dots)
- Evaluate "alternatives to invasives" and changed promoted natives for "genetic pollution" risks (3 dots)
- Discussion:

    - look at Consortia of California Herbaria for introduction dates
    - determine which species come in through certain pathways?
    - there is not much literature on weeds along transmission corridors → more research needed?
    - some pathways of entry are obvious to us but not well documented in the literature

Poster #5: Human Pathways & Prevention – 19 dot stickers total

- General human pathways and prevention (2 dots)
- Which plants move along roads, railroads, levees, and utility corridors (5 dots)
- Nitrogen deposition and serpentine grasslands or desert (2 dots)
- How to change land management under climate change? (4 dots)
- Fire fuel management in grassland, chaparral, coastal sage scrub (2 dots)
- Periodic disturbance – post fire/forest harvest (2 dots)
- Citizen monitoring/early detection and prevention
- Levee management/BMPS/how maintenance is done (2 dots)
- Discussion:
    - a lot of management assumes that it is moving towards restoration, but it may be more actively managed
    - why wasn't disturbance mentioned sooner?
    - with levees, some management may encourage invasives

Poster #6: Control & Management – 22 dot stickers

- Compile herbicide impact information (1 dot)
- Which native plants are not killed by herbicides? (0 dots)
- Techniques to facilitate timed high intensity grazing (2 dots)
- Seed bank depletion for eradication (5 dots)
- Secondary effects of control methods (1 dot)
- Replace ecological process with management process (1 dot)
- Managing for acceptable thresholds of invasives (3 dots)
- State/region-wide standards for monitoring treatment methods to generate comparable data sets (7 dots)
- Inexpensive control options in sensitive habitats (1 dot)
- Discussion:
    - this category had a lot of comments, but few dots
    - must realize eradication is not feasible
    - standardization is important
    - quick and easy monitoring is important for managers
    - in Australia, the weed search tool estimates the cost of eradication
    - depleting the seed bank to facilitate eradication would be feasible in a very small number of places

Poster #7: Restoration – 25 dot stickers total

- General restoration (5 dots)
- What combinations of plants will persist? (2 dots)

- Maximize success of passive restoration (9 dots)
- Easy ways to do effectiveness monitoring (4 dots)
- Soil restoration studies (4 dots)
- Do expected/desirable plant communities return after eradication/treatment? (1 dot)
- Discussion:
    - there are some general assumptions in the document about restoration that may or may not be accurate
    - SurCal may be able to help with maximizing the success of passive restoration
    - removing invasives is a type of restoration – restoration groups are now realizing this
    - if a contractor is hired to do management, who monitors it's success and progress?
    - how can monitoring be made easier?
    - restorationists should also be aware of wildlife or other goals before designing a project
        - social issue: use different language, i.e. "restoration" not "killing"

Poster #8: Economic Impacts – 44 dot stickers

- General economic impacts (23 dots)
- Quantifying economic impacts of invasives (11 dots)
- Ecosystem service costs (8 dots)
- Scale up project from single plant → large area (1 dot)
- Cost/benefit and funding sources for an invasive species rapid response fund – also social & policy issue (1 dot)
- Thresholds based on economics (0 dots)
- Discussion:
    - surprising emphasis on this
    - need to focus on this more, get collaborators and foster partnerships
    - outreach to economists!
    - always need cost/benefit analyses for control – need to multiply this by the spread rate
    - value ecosystem services and include non-market valuation
    - how do we get money and use it efficiently?

Poster #9: Social Issues – 23 dot stickers total

- General social issues (3 dots)
- Psychology of what to protect/when to manage (4 dots)
- Use larger community to develop projects (2 dots)
- Develop effective messages for weed work (4 dots)
- How do different communities decide to use/not use herbicide? (4 dots)
- Work on local politics to get projects done (1 dot)
- Perceptions of invasive plants (positive/negative) by local communities (5 dots)
- Weed resistant human communities (0 dots)

- Synthesis of information for the public (0 dots)
- Decision support (0 dots)
- Discussion:
    - there is a need to educate the public and synthesize information for the public (i.e. Jared Diamond)
    - there is a need to convince the public that ecosystem services are important
    - this priority may not be as high because we don't understand social science → we need more social scientists to help us
    - education is a policy issue, too
    - we need more research on herbicide decisions
    - how does our message affect communities?
    - we need to understand emotional connections to plants within communities and among individuals
    - there is a need to educate the public about invasive species and ecology

Poster #10: Policy & Laws – 17 dot stickers total

- General policy and law issues (5 dots)
- CA invasive species advisory council (3 dots)
- Evaluate CDFA noxious weed list (2 dots)
- Evaluate WMA program (2 dots)
- Voluntary industry self-regulation vs. government regulation (5 dots)
- How to work on weed issues that cross WMA/state boundaries (0 dots)
- Discussion:
    - WMA programs should be compared between states, etc.
    - how does science get into policy and decision-making?
    - need to collaborate
    - most scientists don't want to be in politics
    - this is not research, it is providing information to make decisions

Wrap-up:

- there is a gap that needs to be filled by social scientists and economists
- people understand money and economists can help put ecological issues into those terms
- there needs to be some bridge between science and policy makers