

Coordinating the IUCN Red List of North American Tree Species: a Special Session at the USFS Gene Conservation of Tree Species Workshop¹

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Abstract

Conservation status assessments are a valuable tool for the management and protection of rare and endangered species. Categorizing and defining rarity, threats, and population trends is often the first step toward understanding and documenting the health of the world's plant diversity. Having up to date conservation status assessments for all of North America's native tree species, based on a globally standardized system, would enable an objective and systematic prioritization of species for future conservation action and enable stakeholders from a wide range of sectors to engage in informed conservation efforts. For over 50 years, the IUCN Red List of Threatened Species has been the international standard for evaluating the extinction risk of plant and animal species on a global scale. Currently, the tree flora of North America is poorly represented in the IUCN Red List. However, there are other more regionally focused threat assessment platforms being used in North America, creating an opportunity to streamline assessment efforts, share information, and ensure that all of the tree species in the region are evaluated for their level of imperilment. This initiative will require coordination and collaboration among multiple sectors and organizations to ensure that limited resources are maximized to cover all tree species and prevent any threatened taxa from slipping through the cracks. To initiate this collaborative effort, a special session was convened at the Gene Conservation of Tree Species workshop during which experts from each of the four complementary threat assessment platforms (IUCN Red List, NatureServe, United States Endangered Species Act, and U.S. Department of Agriculture Forest Service CAPTURE Program) presented their methods, applications, and progress for evaluating imperilment of North American tree species. A productive discussion session followed that sparked the development of a two phase collaborative project: 1) create a comprehensive, unified checklist of the tree species of North America that can be used to identify gaps and missing taxa from the various assessment platforms, and 2) fill those gaps by systematically and strategically evaluating species so that the threat level of all native trees of North America is known by 2020.

Introduction to the Special Session

For over 50 years, the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species has been the international standard for evaluating the extinction risk of plant and animal species. It is important to ensure that the trees of North America are assessed for the IUCN Red List so that the rich tree flora of that continent can be included in globally standardized biodiversity metrics such as the Barometer of Life (Stuart et al. 2010) and the Red List Index, and to contribute to international conservation policy objectives like the Global Strategy for Plant Conservation (Sharrock 2012). Regionally, there are several different mechanisms for assessing the imperilment of a species in North America (for this initiative we are following the geographic delimitation from the Flora of North America

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– “all trees native and naturalized found in North America north of Mexico.” See Flora of North America Editorial Committee, 1993), including: 1) the IUCN Red List, 2) NatureServe’s Conservation Status Assessments, 3) the U.S. Endangered Species Act, and 4) U.S. Department of Agriculture Forest Service’s (USDA FS) Project CAPTURE (Conservation Assessment and Prioritization of Forest Trees Under Risk of Extirpation). All of these processes evaluate demographic, distribution, population trend, and threat data for a given species to quantify its risk of extinction, but how are they related to each other? What are the requirements and data inputs for each process? What are the pros and cons of each application? Do they build off of each other? And most importantly, can they be streamlined and coordinated to achieve a comprehensive Red List of North American Tree Species, ensuring that extinction risk data from this region is included in global analyses and policy frameworks? During this special session, attendees heard from four experts who explained the fundamentals of each of these conservation status assessment platforms and outlined how each could contribute to a Red List of North American Tree Species. A group discussion followed the presentations, during which much progress was made on establishing a North American tree working group for the purpose of undertaking an initiative to complete Red List assessments for all North American tree species.

Why Conduct Conservation Status Assessments?

Conservation status assessments are a valuable tool for the management and protection of rare and endangered species. Categorizing and defining rarity, threats, and trends is often the first step toward prioritizing which plants are in most urgent need of conservation action. Having up to date conservation status assessments for all of North America’s native tree species, based on a globally standardized system, would enable an objective and systematic prioritization of species for future conservation action and enable stakeholders from a wide range of sectors to engage in informed conservation efforts.

Conservation status assessments also provide policy makers with clear evidence to support protective regulations for threatened species. Furthermore, many funding agencies and conservation nonprofits require such an assessment as a component of funding proposals targeting threatened plant or animal species.

Target 2 of the Global Strategy for Plant Conservation calls for “an assessment of the conservation status of all known plant species [...] to guide conservation action” (CBD 2012). At a more regional level, Target A2 of the North American Botanic Garden Strategy for Plant Conservation mandates that “all botanic gardens with the capacity will review and contribute to assessments of the conservation status of plant species, using criteria and standards developed by NatureServe and the IUCN” (BGCI 2016). These two international policy documents provide the framework and foundation for meeting ambitious plant conservation goals that have been identified as crucial to sustaining healthy ecosystems and global biodiversity.

Comparison of Conservation Status Assessment Platforms in North America

The IUCN Red List of Threatened Species

Established in 1964, the IUCN Red List of Threatened Species is the world’s most widely adopted system for evaluating the threat level of plant and animal species (IUCN 2001). The Red List aims to provide an objective baseline from which to measure and monitor the state of the world’s biodiversity and puts species into a global context for setting conservation priorities. IUCN Red List assessments are based on applying a well-defined and rigorous set of Categories and Criteria, which are tiered thresholds for various population and demographic metrics, such as population growth trends, geographic range size, number of mature individuals, and habitat quality. Based on meeting the predetermined thresholds, species may qualify for one of three threatened categories: Critically Endangered (CR; extremely high risk of extinction in the wild), Endangered (EN; very high risk of extinction), or Vulnerable (VU; high

risk of extinction). Other categories include Extinct (EX; no longer extant anywhere in the world) and Extinct in the Wild (EW; existing only in captivity or ex situ collections), as well as Near Threatened (NT; does not currently reach a threatened threshold, but is likely to qualify in the near future if no intervention is taken), Least Concern (LC; widespread and abundant) or Data Deficient (DD; inadequate information to confidently determine the category, or ambiguous/conflicting information that places the species in many different categories). Species that have never been processed through the IUCN Red List Categories and Criteria are considered Not Evaluated (NE), the category to which the vast majority of plants are currently assigned. The IUCN Red List is a dynamic system, designed to provide a baseline or snapshot in time for each species based on the best available information *at that time*. Assessments officially expire after 10 years, so assessors are encouraged to reassess species at least that often, prioritizing those taxa that are threatened (CR, EN, VU) or Near Threatened. The dynamic nature of the Red List allows for the IUCN to generate the Red List Index and Barometer of Life—indicators of global biodiversity trends over time. An illustration of the IUCN Red List threat assessment categories can be seen in fig. 1.

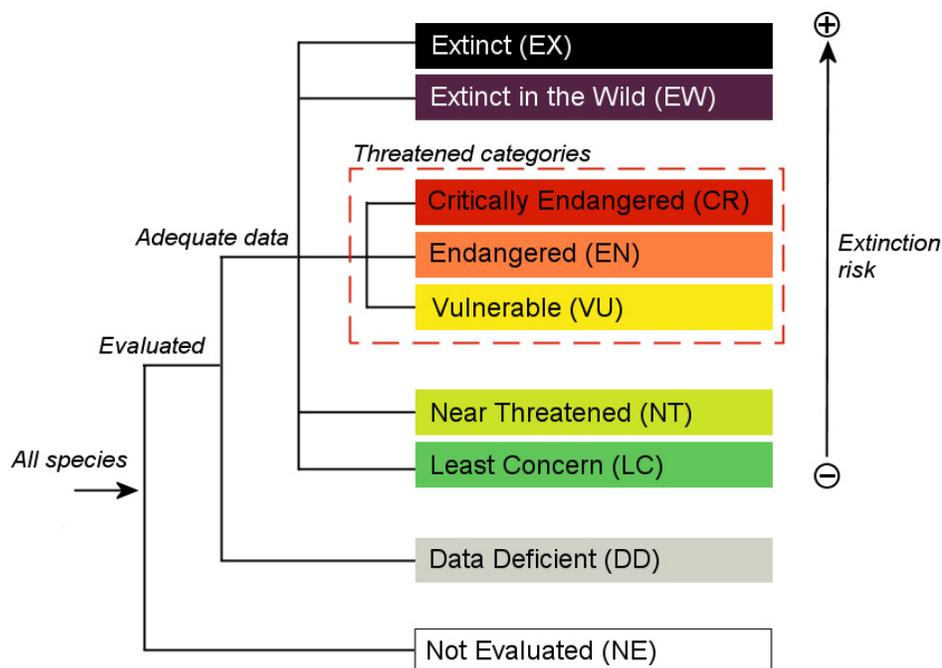


Figure 1—The IUCN Red List of Threatened Species categories.

Anyone can become certified by the IUCN through an online training system to participate in compiling or reviewing an IUCN Red List threat assessment, although the vast majority of assessments are completed by members of IUCN Species Survival Commission Specialist Groups. The specialist groups are made up of taxonomists, researchers, and field biologists who are experts of particular taxonomic groups, geographic regions, or specific habitat types. For example, there are specialist groups that focus on cacti, amphibians, plants of the Hawaiian Islands, arctic plants and crop wild relatives, to name a few. There is also a Global Tree Specialist Group (GTSG) that coordinates and leads Red List efforts for all of the world’s tree species. The GTSG has recently launched an ambitious project, the Global Tree Assessment, which aims to have threat assessments completed for all of the world’s estimated 60,000 to 80,000 tree species by 2020. Botanic Gardens Conservation International (BGCI), which provides the secretariat for the GTSG, is also in the process of developing the most comprehensive database of tree species, GlobalTreeSearch, the only full list of the world’s tree species geo-referenced to

country level. GlobalTreeSearch provides the backbone for tracking progress of the Global Tree Assessment.

The IUCN does not have its own strict definition of a tree, and leaves the growth habitat designation for a plant species up to the discretion of the individual assessor. As of April 2017, there were 245 tree species published on the IUCN Red List from continental North America (Canada and the United States, excluding Hawaii; the IUCN SSC Hawaiian Plant Specialist Group is currently systematically assessing all Hawaiian trees, so those taxa are excluded from this analysis), of which 9 percent were last assessed at least 10 years ago and are out of date. Estimates from BGCI, NatureServe, and the USDA indicate there are around 1000 tree species in continental North America, so there is clearly work to be done to evaluate threats to trees in this region and to ensure the threat assessments are globally standardized and accessible. Of the four threat assessment platforms, the IUCN Red List is the least complete for tree species of North America.

NatureServe Conservation Status Assessments

The NatureServe Network represents a public-private consortium of independent organizations operating across the Western Hemisphere that gathers, analyzes, and distributes biodiversity data on species and ecosystems to advance scientifically informed conservation actions. This network of United States Natural Heritage Programs and Canadian Data Centres has been assessing the conservation status of North American species for over 30 years. It has compiled over 70,000 plant and animal conservation status assessments based on its own system of evaluation of potential extinction or extirpation risk considering rarity, threats and population trends (Faber-Langendoen et al. 2012, Master et al. 2012). The NatureServe conservation Ranks are completed at three nested, geographic scales: Global (G), National (N), or Subnational (S). Species and infraspecific taxa (varieties and subspecies) are ranked from most endangered to least endangered on a scale of 1 to 5 (table 1). NatureServe ranks also include GX (Presumed Extinct) and GH (Possibly Extinct), as well as variant ranks and rank qualifiers (table 1). Uncertainty in a Global Rank is expressed through a Range Rank or a rank qualifier of ? or Q.

Table 1—The NatureServe conservation status assessment global ranks, variant global ranks, and rank qualifiers

Global (G) Rank	Definition
GX	Presumed Extinct—Species not located despite intensive searches and virtually no likelihood of rediscovery.
GH	Possibly Extinct—Known from only historical occurrences but still some hope of rediscovery.
G1	Critically Imperiled—At very high risk of extinction due to extreme rarity, very steep declines, or other factors.
G2	Imperiled—At high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors.
G3	Vulnerable—At moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors.
G4	Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5	Secure—Common; widespread and abundant.
Variant Global Ranks	
G#G#	Range Rank—A numeric range rank (e.g., G2G3, G1G3) used to indicate uncertainty about the exact status of a taxon.
GU	Unrankable—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
GNR	Unranked—Global rank not yet assessed.
GNA	Not Applicable—A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
Rank Qualifiers	
?	Inexact Numeric Rank—Denotes inexact numeric rank; this should not be used with any of the Variant Global Conservation Status Ranks or GX or GH.
Q	Questionable taxonomy that may reduce conservation priority—Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon or type in another taxon or type, with the resulting taxon having a lower-priority (numerically higher) conservation.
C	Captive or Cultivated Only—At present presumed or possibly extinct in the wild across entire native range but extant in cultivation, in captivity, as a naturalized population outside their native range, or as a reintroduced population, not yet established. Possible ranks are GXC or GHC.

The thresholds and criteria of the NatureServe assessment process consider much of the same information and metrics that would be used to conduct an IUCN Red List assessment. Like the Red List, a standardized, scientific, empirical and objective methodology has been established and improved over several decades. Many of the concepts and terms are interchangeable between the two platforms, such as the Area of Occupancy, Extent of Occurrence, Population Size, and the way in which threats are classified and coded (Salafsky et al. 2008). Furthermore, many of the thresholds between the different categories are set at the same level, so in the vast majority of cases the NatureServe rankings and the Red List categories are largely in alignment (table 2). However, NatureServe rankings cannot automatically be transferred over to a Red List category—the assessment process must be done independently for each platform. Like the Red List, NatureServe rankings are also dynamic and are regularly monitored and prioritized for updating, based on known new threats or changing population trends.

Table 2—Comparison of NatureServe and IUCN Red List Global Statuses (adopted from Master et al. 2012)

NatureServe Global Status	IUCN Red List Status
Presumed Extinct (GX)	Extinct (EX)
Presumed Extinct in the Wild ^a (GXC)	Extinct in the Wild (EW)
Possibly Extinct (GH)	Critically Endangered (CR) (possibly extinct)
Possibly Extinct in the Wild ^a (GHC)	Critically Endangered (CR) (possibly extinct)
Critically Imperiled (G1)	Critically Endangered (CR)
Critically Imperiled (G1)	Endangered (EN)
Imperiled (G2)	Vulnerable (VU)
Vulnerable (G3)	Near Threatened (NT)
Apparently Secure (G4)	Least Concern (LC)
Secure (G5)	Least Concern (LC)
Unrankable (GU)	Data Deficient (DD)

^a Species ranked GXC and GHC are presumed or possibly extinct in the wild across their entire native range, but are extant in cultivation, in captivity, as a naturalized population (or populations) outside its historical native range, or as a reintroduced population not yet established. The C modifier is only used with status ranks at a global level, and not a national or subnational level. Similarly, IUCN’s EW status is only used at a global level.

Where the IUCN Red List and NatureServe begin to diverge is in the process of evaluating the available population trend and rarity data. NatureServe ranks follow a weight-of-evidence approach with minimum criteria, whereas the Red List is based on criteria (rules) with greater emphasis on trends rather than rarity. NatureServe Ranks have been used extensively by United States and Canadian state and federal agencies, including state natural heritage programs, and as such is much more complete than the Red List for the United States and Canada. Because the Ranks are nested within three geographic scales, data from Subnational and National Ranks are used to inform Global Ranks. Nearly every vascular plant in the United States and Canada has been assessed at least once on the NatureServe platform. Of the estimated 1000 tree species, over 97 percent have been assigned a Global Rank by NatureServe. The NatureServe Ranks indicate that while most North American tree taxa are Apparently Secure (GT4; the “T” in the rank indicates that both species level and infrataxa—trinomial—are included in the analysis) or Secure (GT5), about 14 percent are Critically Imperiled (GT1), Imperiled (GT2), or Vulnerable (GT3) (Figure 2). However, about 75 percent of the NatureServe assessments have not been reviewed in over 10 years. These assessments need to be reviewed to incorporate current threats and trends. For a thorough (although now outdated) review of the NatureServe platform compared to the Endangered Species Act and the IUCN Red List, see Master et al. 2000.

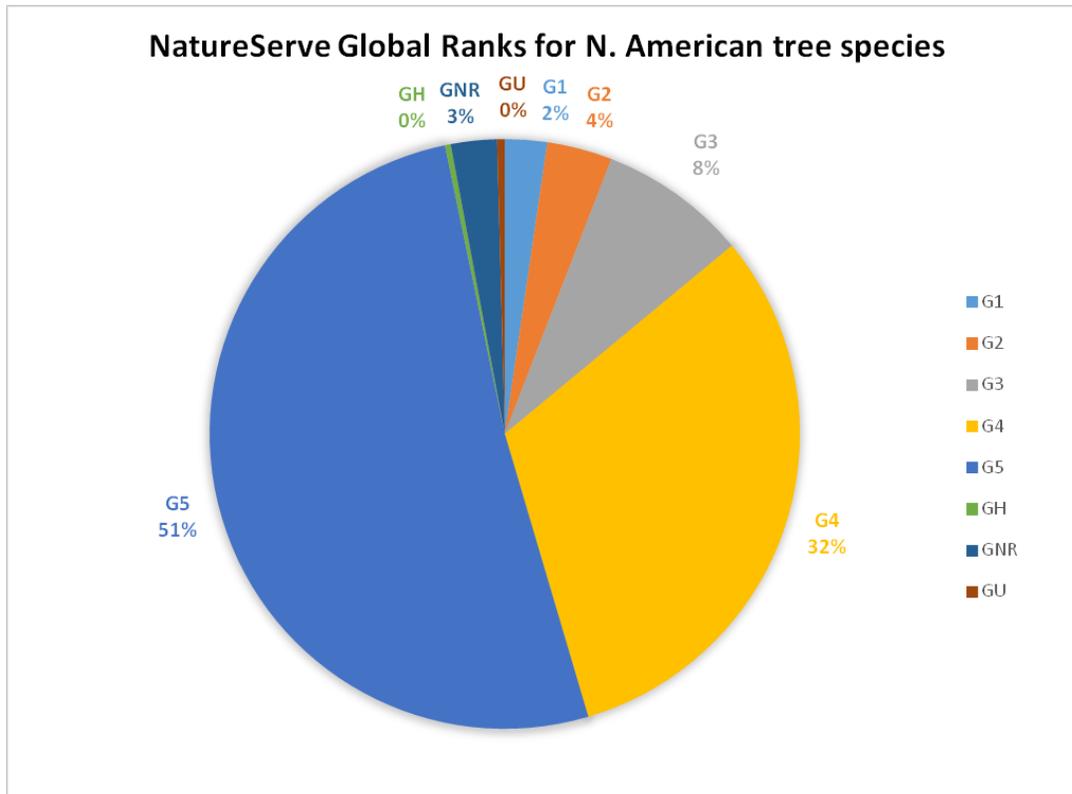


Figure 2—Conservation status of continental North American tree taxa based on NatureServe global rounded ranks. The “T” in the rank (e.g., GT1) indicates that both species level and infrataxa (Trinomials) are included in the analysis. Data from NatureServe’s Biotics database accessed April 21, 2017.

Conservation Assessment and Prioritization of Forest Trees at Risk of Extirpation – Project CAPTURE

In 2010, the USDA FS started a focused effort in conservation of at-risk forest tree species for the purpose of categorizing and prioritizing species and developing a scientifically informed strategy for seed collection, storage, and propagation of threatened forest trees. Project CAPTURE is a data-driven and expert-guided assessment framework and a scalable tool to help decision makers address and prioritize forest resilience and restoration planning, genetic conservation efforts, and threat mitigation efforts based on species’ threats and life history traits (Potter and Hargrove 2013, Potter et al. 2017). The assessment framework integrates threat vulnerability projections with species trait data metrics to categorize each species based on their scores within three vulnerability dimensions: 1) sensitivity to a threat, 2) severity of the threat, and 3) adaptive capacity (fig. 3). A species with high scores in all three dimensions, for example, would have the highest vulnerability and need for conservation action.

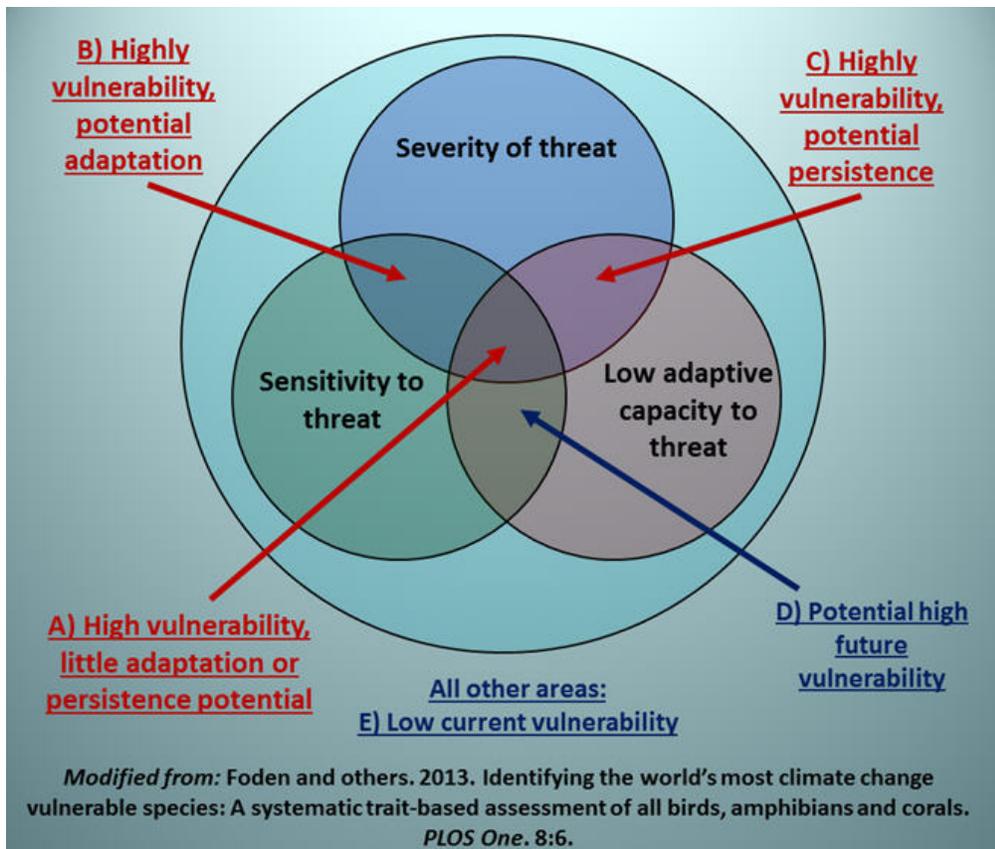


Figure 3—Project CAPTURE prioritization framework combines life history and trait data with climate change modeling to rank species' inherent risk of extirpation.

Collaborators on Project CAPTURE have evaluated around 420 United States native tree species for vulnerability to projected climate change using this detailed and sophisticated methodology (Potter et al. 2017), providing prioritized lists of species for recommended conservation action. The number of tree species evaluated for that study was fewer than the 1,000 estimated for North America, because the assessment was limited only to species of the United States (excluding the high plant diversity of Mexico) and that met the USDA FS's Forest Inventory and Analysis Program's definition of a tree: woody perennial plants that usually have a single well-defined erect stem having a more or less definitely formed crown of foliage, a stem diameter at maturity of at least 7.62 cm, and a height at maturity of at least 4.75 m. While the Project CAPTURE framework has been applied so far in the context of species vulnerability to climate change, insect and disease infestations are arguably a more serious and immediate threat to the genetic integrity of tree species. An effort applying the Project CAPTURE framework to pest and pathogen threats for North American tree species is currently underway. As with the climate change assessment, it will incorporate expert opinion regarding which species attributes should be included, and to which of the three vulnerability dimensions (threat severity, threat sensitivity, and adaptive capacity) they will be designed. When that assessment is complete, species' vulnerability to both climate change and pests and pathogens will be combined to prioritize those at greatest risk; this step will incorporate expert opinion on the final species ratings.

Similar to the IUCN Red List and NatureServe, CAPTURE uses demographic data (e.g., population size, density), range size and threats, but also includes other life history characteristics such as attributes associated with genetic diversity, ecological limitations, and propagule dispersal ability. These attributes are organized into the three vulnerability dimensions based on expert opinion. The framework also can include additional weighting factors such as ecological and economic importance, evolutionary distinctiveness, and regional conservation responsibility when giving species final scores within

vulnerability classes (A through E in fig. 3). As such, the amount, type, and depth of data gathered for these assessments may be much different than for an IUCN Red List or NatureServe assessment. The primary emphasis of the Project CAPTURE framework is different than that of the other assessments in that it focuses specifically on categorizing species based on the degree to which they may be vulnerable to genetic degradation, defined as a significant reduction in the ability of species to persist for the next century while maintaining sufficient genetic variation to adapt to changing environmental conditions (Potter et al. 2017). The application of the framework, then, is to identify groups of species requiring similar sets of strategies to maintain adaptive genetic variation, whether or not the species are currently at risk of extirpation in all or parts of their distributions. The strategies needed for groups of species may include conservation activities, but may also include routine monitoring and management. Given its reliance on detailed species-level data, the CAPTURE framework may be more difficult to apply to very rare and poorly known species and could exclude species from high-vulnerability categories if it were applied in regions of the world where botanical data are lacking, such as in biodiversity hotspots like tropical forests. The framework is flexible to regional differences in data availability, however. Data are currently being collected for separate vulnerability assessments of 562 tree species in Puerto Rico and the United States Virgin Islands, and of 304 tree species in Hawaii. These assessments will, by necessity, incorporate less information than is available for species native to the continental United States.

U.S. Endangered Species Act

Within the United States, the Endangered Species Act (ESA) is a law designed to conserve imperiled species and the ecosystems upon which they depend. Plant and animal species in the United States are listed under the ESA as either Endangered (in danger of extinction throughout all or a significant portion of its range) or Threatened (likely to become endangered within the foreseeable future). Before a plant or animal species can receive the protection provided by the ESA, it must first be added to the federal lists of endangered and threatened wildlife and plants. The List of Endangered and Threatened Wildlife (50 CFR 17.11) and the List of Endangered and Threatened Plants (50 CFR 17.12) contain the names of all plant and animal species that have been determined by the United States Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (for most marine life) to be in the greatest need of federal protection. A species is added to the list when it is determined to be endangered or threatened because of any of the following factors: 1) the present or threatened destruction, modification, or curtailment of its habitat or range; 2) over utilization for commercial, recreational, scientific, or educational purposes; 3) disease or predation; 4) the inadequacy of existing regulatory mechanisms; and 5) other natural or manmade factors affecting its survival.

There is no program under the ESA for systematically evaluating all plant and animal species in the United States. Species are evaluated for listing under the ESA either through a petition process or through the candidate assessment process. The ESA provides that any interested person may petition the Secretary of the Interior, or the Secretary of Commerce for most marine life, to add a species to, or to remove a species from, the lists of endangered and threatened species. Through the candidate assessment process, USFWS biologists identify species as listing candidates. Once a species is listed as threatened or endangered under the ESA, it is eligible for federal protection, recovery planning, and funding (if available) for conservation actions. Furthermore, federal agencies must ensure their actions (e.g., building a highway) do not jeopardize the continued existence of the species..

Summary

Of all of the threat platforms described, the ESA is the only legally binding, policy-driven platform that requires stakeholders to modify actions to protect the species. The other three platforms provide information and recommendations and enable species to be prioritized for action, but do not result in any legally mandated conservation activities. However, it is worth noting that the USDA FS uses NatureServe rankings as a tool to identify Species of Conservation Concern as required by land management planning regulations. A comparison of the four different threat assessment platforms is presented in table 3.

Table 3—Comparison of the four different threat assessment mechanisms presented in the special symposium

	IUCN Red List	NatureServe	USFS Project Capture	USFWS Endangered Species Act
Geographic focus of platform	Global	Regional	National	National
Geographic scope of assessments	Global, Regional, National	Global, National, Subnational	National	National
Biological scale	Plants, Animals, Fungi	Plants, Animals, Fungi	Trees	Plants, Animals
Amount of data needed	Moderate	Moderate	High	High
Accessibility of assessments	High	High	Moderate	High
Accessibility of underlying data	Moderate	High	Low	Moderate
Degree of completion (relative to scope)	Low	Medium/High	High	Low
Assessors	Gardens, academia, taxonomic experts, gov't agencies (anyone certified)	Natural heritage and partner organizations, taxonomic experts, academia	USFS staff, academia, taxonomic experts, (CAPTURE) collaborators	USFWS staff
Legally binding protections for threatened species	No	No	No	Yes

While the four different conservation status assessment mechanisms highlighted in this special symposium all rely on similar underlying data, they each have unique applications, purposes, scopes, benefits, and drawbacks. The IUCN Red List and NatureServe are focused on assessing all flora and fauna across broad geographic scales to prioritize species in need of conservation, whereas Project CAPTURE and the ESA have much more specific and targeted purposes. The IUCN Red List and NatureServe require less underlying data, are higher throughput platforms, and are used by and accessible to a wider audience than the other two. They also often rely on expert opinion and unpublished data from those with firsthand knowledge of each species' threats and trends. Because CAPTURE and the ESA have more targeted purposes, these assessments typically are more involved and detailed than the IUCN Red List or NatureServe, but the emphases and objectives of each are different as well. For example, NatureServe's Ranks and IUCN Red List assessments are often used as supporting information to petition the listing of a species as Threatened or Endangered under the Endangered Species Act. Once a species is designated as Threatened or Endangered, and therefore a priority for conservation action, the ESA supports and undertakes detailed research that will inform regulations and recovery planning. Likewise, Project CAPTURE involves more quantitative data, sophisticated evaluation, and analysis than the IUCN Red List or NatureServe. There are inherent tradeoffs in balancing the amount of data required for an assessment and the rigor of the evaluation and review process with the time and money needed to complete a single assessment.

Panel Discussion During the Special Session

Following the presentations on the four threat assessment mechanisms at play in North America, an open discussion with the audience commenced. It was agreed that there was a pressing need to complete and update threat assessments for all of the North American tree species, and that coordination and collaboration between stakeholders operating under the various assessment platforms was of the upmost importance. Moving forward, the opportunities for assessment coordination and streamlining are highest for the IUCN Red List and NatureServe processes. Of the four assessment processes reviewed here, these two are the most similar, rely on the same underlying data inputs, and follow a well-aligned ranking system. Both systems could be adapted to efficiently and systematically incorporate data and results from each other. In fact, initiatives are already underway between the Red List, NatureServe, and USDA FS to streamline and coordinate threat assessment efforts. An ongoing project to increase efficiency is focusing on a tool to import existing conservation status data into the Red List database assessment system. NatureServe is working with the IUCN to determine a process by which each systems' data can be exported and imported into the other database.

Interestingly, despite having a thoroughly well studied native flora, the United States and Canada do not have a single, centralized database of native tree species. Several floras and checklists exist for the region, including the Flora of North America, the USDA PLANTS database, and Biotics (the backbone of the NatureServe database), which all have varying degrees of agreement over taxonomic concepts and which taxa are considered trees. One of the challenges to achieving a comprehensive list of North American trees lies in establishing a widely agreed upon definition for what makes a tree a tree. GlobalTreeSearch, the global database of trees developed by BGCI, relies on information provided by individual countries, so by developing a definitive list of trees of North America, the global list of trees would also be strengthened.

Progress Since the Special Session: Creating a Red List of North American Trees

As a result of this Special Session, a collaborative effort is now underway between NatureServe, The Morton Arboretum, BGCI, and the USDA FS to create a definitive list of tree species of continental North America and complete threat assessments for all of the tree species under both the IUCN Red List and NatureServe platforms simultaneously (a complementary initiative is underway to assess all of the Hawaiian native tree species by the IUCN Hawaiian Plants Specialist Group). The checklist of trees will be used to update BGCI's GlobalTreeSearch database, and will provide the foundation for the longer term initiative to update and/or complete NatureServe Global Ranks and IUCN Red List assessments for all North American trees.

Several steps are needed to produce the North American tree checklist. First, the designation of a species as a tree must be articulated and agreed upon through a review process with a variety of botanical experts. Second, existing checklists and authorities must be consulted and cross-referenced to ensure taxonomic accuracy and legitimacy. This process will be conducted in coordination with related taxonomic and checklist efforts underway by the database coordinators of NatureServe, the Flora of North America, USDA PLANTS, Tropicos (Missouri Botanical Garden), BGCI's PlantSearch, the IUCN Red List, and other taxonomic experts. Once tree designations and preliminary checklists are created, the list must be quality checked and put through a review process by taxonomic experts and other relevant stakeholders. After review and general approval, the list will be cross-referenced to the IUCN Red List, USDA FS's Project CAPTURE database, and NatureServe Global Ranks, which will provide a preliminary threat category assessment for every species, including data deficient (DD) and not evaluated (NE) taxa. Upon reaching this milestone, we will get a sense of the scope of the task at hand to complete or update a NatureServe Global rank and IUCN Red List threat assessment for every tree species—phase two of this initiative. In phase two, funds will be raised to support the coordination and streamlining of NatureServe and IUCN Red List assessments for priority species, so that all North American tree species

have been evaluated on at least one platform in the past 10 years. Being dynamic systems, the assessments on these platforms can be updated as new threats emerge, additional information becomes available, or the positive impact of conservation efforts on threatened species become realized.

The results of these two efforts (the checklist of tree species and the completed threat assessments) will provide the critical knowledge needed to inform and coordinate tree conservation actions across an entire continent. The impact of this initiative will be wide reaching and provide the opportunity to launch a public awareness campaign for the need for tree conservation in North America. In turn, the public awareness campaign will leverage funding opportunities and inspire community engagement. The Red List of North American Tree Species will also significantly contribute to the Global Tree Assessment and to achieving the targets of the Global Strategy for Plant Conservation and the North American Botanic Garden Strategy for Plant Conservation. Ultimately, it will provide a comprehensive picture of the extinction risk of North American trees based on a globally standardized and recognized system of threat assessment.

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