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Tribal Data Sovereignty

Literature Review & Annotated Bibliography

This review synthesizes 39 sources — peer-reviewed studies, policy instruments, federal and tribal agency guidance, practitioner protocols, and case studies — on Tribal Data Sovereignty and Indigenous data governance. It is the literature foundation underneath VPDC's synthesis, *Principles and Practices for Working with Tribal Data.*

Prepared by: David Diaz, Vibrant Planet Data Commons Forest Data Scientist.

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Companion material: *Valuing Indigenous Knowledge* by Michael Wilson, and VPDC's integrated synthesis *Principles and Practices for Working with Tribal Data*.

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Tribal Data Sovereignty: Literature Review & Synthesis

Acronyms

5. **AI/ML**: artificial intelligence / machine learning
6. **API**: application programming interface
7. **CARE**: Collective Benefit, Authority to Control, Responsibility, Ethics
8. **CBPR**: community-based participatory research
9. **FAIR**: Findable, Accessible, Interoperable, Reusable
10. **FNIGC**: First Nations Information Governance Centre
11. **FPIC**: free, prior and informed consent
12. **GIDA**: Global Indigenous Data Alliance
13. **ILTF**: Indian Land Tenure Foundation
14. **IP**: intellectual property
15. **IRB**: institutional review board
16. **MDSA**: Material and Data-Sharing Agreement
17. **NCAI**: National Congress of American Indians
18. **OCAP®**: Ownership, Control, Access, Possession

19. **RDA**: Research Data Alliance
20. **TEK**: Traditional Ecological Knowledge
21. **TK**: Traditional Knowledge
22. **UNDRIP**: United Nations Declaration on the Rights of Indigenous Peoples
23. **USDA**: U.S. Department of Agriculture

Executive Summary

For organizations that develop data, models, and technologies who intend to do work with or support tribal governments and communities, there are several direct takeaways summarized here.

Orienting principles (how to interpret "requirements")

- **Treat data work as governance work**. Many reviewed resources frame data and knowledge as tied to sovereignty, rights, and institutional power—not as neutral technical inputs—so implementation choices should align with tribal governance decisions (United Nations (2007); Smith (2012); Carroll et al. (2019); Rainie et al. (2017)).

- **Use a "FAIR + CARE" lens when applicable**. FAIR (Findable, Accessible, Interoperable, Reusable) emphasizes technical reuse; CARE (Collective Benefit, Authority to Control, Responsibility, Ethics) emphasizes people, purpose, authority, and benefit-sharing (Carroll et al. (2020); Carroll et al. (2021); GIDA (2026)).

- **Assume secondary-use poses risks by default**. Once shared, data may be reused, linked, and interpreted outside the original context; governance choices should be designed for that reality (Rainie et al. (2019); Carroll et al. (2020); Hudson et al. (2020)).

Engagement and decision rights (before any data collection or "data request")

- **Start with government-to-government engagement where applicable**. In federal and public-lands contexts, reviewed guidance emphasizes consultation and trust responsibility as governing context for information flows and decisions (Jewell (2014); USFS R&D (2015); Case-Scott & Lynn (2021)).

- **Define who decides**. Identify the tribal decision-makers for the project (e.g., leadership, program staff, cultural authorities), and clarify which decisions require formal approval (Harding et al. (2012); Native Governance Center (2024); Steen-Adams et al. (2023)).

- **Establish consent at the right level(s)**. Several resources emphasize that individual consent and institutional review can be insufficient for community-level risks; plan for tribal government oversight and collective decision processes (Harding et al. (2012); Hudson et al. (2020); Smith (2012)).

Contracts, governance instruments, and boundaries (make expectations enforceable)

- **Use written agreements early**. Define ownership/custody, access, permitted uses, retention, publication review, and downstream reuse restrictions in a data-sharing agreement or equivalent instrument (Harding et al. (2012); Carroll et al. (2019)).

- **Plan for "as open as determined by Indigenous communities"**. If a project has open-science or open-data goals, pre-define what will be open, what will be restricted, and what will not be collected or published (Carroll et al. (2021); FNIGC (2018); Rainie et al. (2019)).

- **Treat terms-of-use as governance**. Platform/API access terms are one way to operationalize permitted/prohibited uses, attribution, and enforcement (Native-Land.ca (2024)).

Indigenous Knowledge / TEK / TK (avoid turning relationships into extraction)

- **Do not treat knowledge as "just another feature"**. Multiple resources emphasize that Indigenous Knowledge and Traditional Ecological Knowledge (TEK) require protocols for access, protection, and decisions about what may be recorded or made public (Prabhakar et al. (2022); CTKW (2014); Vinyeta & Lynn (2013); Rinkevich et al. (2011); Rossier & Lake (2014)).

- **Design for boundary-setting and "no"**. Some guidance is explicit that the process should support decisions to decline sharing, to keep information local, or to end/redirect projects (CTKW (2014); Indigenous Knowledge Lab et al. (2024); Native Governance Center (2024)).

- **Use protocol signaling in digital systems when relevant**. Traditional Knowledge (TK) Labels and related mechanisms are intended to communicate provenance and appropriate use in mainstream repositories and catalogs (Anderson & Christen (2013); Carroll et al. (2021)).

Data lifecycle controls (collection → storage → access → reuse)

- **Minimize collection and separate sensitive fields**. Identify sensitive categories (e.g., ceremonial/cultural knowledge, site locations) and design minimization, tiered access, and separation of duties (Oaster (2024); Case-Scott & Lynn (2021); Prabhakar et al. (2022)).

- **Metadata and provenance support accountability**. Provenance supports controlled access decisions and reuse constraints (Carroll et al. (2021); Anderson & Christen (2013)).

- **Retention and deletion need explicit rules**. Agreements should specify retention windows, deletion triggers, and what happens to derived artifacts (reports, features, models) (Harding et al. (2012); Carroll et al. (2019)).

Common AI/ML workflow checkpoints

- **Problem framing and success metrics**. Avoid default deficit indicators and co-define measures that match tribal priorities and decision contexts (Rainie et al. (2017); Nickerson (2017); Rodriguez-Lonebear (2016)).

- **Training data rights and reuse**. Confirm that consent/agreements cover model training and future reuse, not just initial analysis. Treat model training as secondary use unless explicitly authorized (Carroll et al. (2020); Hudson et al. (2020); Harding et al. (2012)).

- **Derived artifacts may still be sensitive**. Features, embeddings, model weights, and synthetic data can carry leakage risk; specify whether they are shareable, with whom, and under what controls (Hudson et al. (2020); Carroll et al. (2020)).

- **Access controls and review for deployment**. Use tiered access and approval gates for deployment, especially where outputs could reveal sensitive locations/resources or influence permitting/land-management decisions (Oaster (2024); Case-Scott & Lynn (2021); Long et al. (2018)).

- **Monitoring and incident response**. Plan for misuse, misinterpretation, or downstream policy impacts, including the ability to pause access or revoke use (Native-Land.ca (2024); Rainie et al. (2019)).

Public disclosure and regulatory constraints

- **Account for public-records dynamics**. Federal guidance emphasizes planning for sensitive information and disclosure obligations, including working with counsel and setting expectations before sharing (Prabhakar et al. (2022); Oaster (2024)).

Capacity and reciprocity

- **Budget for tribal capacity and continuity**. Multiple resources emphasize that "good data" practice requires sustained capacity (staffing, tools, infrastructure, training), not just one-off delivery (Rainie et al. (2017); Lovett et al. (2018); Nickerson (2017)).

- **Plan a "give back" pathway**. Partnership guidance repeatedly includes reciprocity and returning value in forms the community defines (Native Governance Center (2024); Steen-Adams et al. (2023); Sowerwine et al. (2019)).

Practical starting checklist (minimum viable governance for developers)

1. **Define scope and data categories**: what will be collected, what will not, and what is sensitive.
2. **Document decision rights**: who approves collection, storage location, access, publication, and model deployment.
3. **Execute an agreement**: permitted uses, prohibited uses, retention/deletion, publication review, and enforcement.

4. **Design access tiers**: restricted datasets, restricted outputs, and controls on derived artifacts (e.g., models).
5. **Write provenance and reuse documentation**: data lineage, training data sources, and downstream reuse conditions.
6. **Plan for withdrawal/termination**: how the project changes or stops and what happens to data and artifacts.

Literature Review

Resources incorporated into this review

1. Anderson and Christen, 2013. 'Chuck a Copyright on it': Dilemmas of Digital Return and the Possibilities for Traditional Knowledge Licenses and Labels. Museum Anthropology Review, 7(1–2), 105–126.

2. Carroll et al., 2019. Indigenous Data Governance: Strategies from United States Native Nations. Data Science Journal, 18(1).

3. Carroll et al., 2020. The CARE Principles for Indigenous Data Governance. Data Science Journal 19, 43.

4. Carroll et al., 2021. Operationalizing the CARE and FAIR Principles for Indigenous data futures. Sci Data 8, 108.

5. Case-Scott and Lynn, 2021. Strengthening the Federal-Tribal Relationship: 25-Year Report on Monitoring Consultation under the Northwest Forest Plan (Northwest Forest Plan: The First 25 Years (1994-2018)). U.S. Forest Service, Pacific Northwest Region.

6. CTKW, 2014. Guidelines for considering traditional knowledges in climate change initiatives. Climate and Traditional Knowledges Workgroup.

7. Eisenberg et al., 2024. Braiding Indigenous and Western Knowledge for Climate-Adapted Forests: An Ecocultural State of Science Report. The Wise Path Forward.

8. FNIGC 2018. The First Nations Principles of OCAP®. First Nations Information Governance Centre. First Nations Information Governance Centre.

9. GIDA 2026. CARE Principles for Indigenous Data Governance.

10. Harding et al., 2012. Conducting Research with Tribal Communities: Sovereignty, Ethics, and Data-Sharing Issues. Environ Health Perspect 120, 6–10.

11. Hoagland et al., 2017. Tribal Lands Provide Forest Management Laboratory for Mainstream University Students. Journal of Forestry 115, 484–490.
12. Hudson et al., 2020. Rights, interests and expectations: Indigenous perspectives on unrestricted access to genomic data. Nature Reviews Genetics, 21(6), 377–384.

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15. Jewell, S., 2014. Reaffirmation of the Federal Trust Responsibility to Federally Recognized Indian Tribes and Individual Indian Beneficiaries (Secretarial Order No. 3335). U.S. Department of the Interior, Secretary of the Interior, Washington, D.C.

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18. Lovett et al., 2018. Good Data Practices for Indigenous Data Sovereignty and Governance. In Good Data (pp. 26–36). Institute of Network Cultures.

19. Marks-Block et al., 2021. Revitalized Karuk and Yurok cultural burning to enhance California hazelnut for basketweaving in northwestern California, USA. fire ecol 17, 6.

20. Native Governance Center, 2024. Partnering with Native Nations in a Good Way. Native Governance Center, Minneapolis, MN.

21. Native-Land.ca 2024. Data Sovereignty Treaty | Native Land Digital API.

22. Nature United 2020. Overview: Our Approach to Working in Partnership with Indigenous Peoples.

23. Nickerson 2017. First Nations' Data Governance: Measuring the Nation-to-Nation Relationship (48 pp.) Prepared for the British Columbia First Nations' Data Governance Initiative.

24. Norton-Smith et al., 2016. Climate change and indigenous peoples: A synthesis of current impacts and experiences (General Technical Report PNW-GTR-944). U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

25. Oaster 2024. In green energy boom, one federal agency made the Yakama Nation an offer they had to refuse. High Country News 56 (7).

26. Prabhakar et al., 2022. Guidance for Federal Departments and Agencies on Indigenous Knowledge.

27. Quaempts et al., 2018. Aligning environmental management with ecosystem resilience: a First Foods example from the Confederated Tribes of the Umatilla Indian Reservation, Oregon, USA. E&S 23, art29.

28. Rainie et al., 2017. Data as a Strategic Resource: Self-determination, Governance, and the Data Challenge for Indigenous Nations in the United States. The International Indigenous Policy Journal, 8(2).

29. Rainie et al., 2019. Indigenous Data Sovereignty. In The State of Open Data: Histories and Horizons (pp. 300–319). African Minds.

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32. Rossier and Lake, 2014. Indigenous Traditional Ecological Knowledge in Agroforestry (Agroforestry Note No. 44). USDA National Agroforestry Center, Lincoln, NE.

33. Smith 2012. Decolonizing Methodologies: Research and Indigenous Peoples. Zed Books.

34. Sowerwine et al., 2019. Enhancing Food Sovereignty: A Five-year Collaborative Tribal-University Research and Extension Project in California and Oregon. Journal of Agriculture, Food Systems, and Community Development 9, 167–190.

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36. UN 2007. United Nations Declaration on the Rights of Indigenous Peoples (UN Doc. A/RES/61/295). United Nations.

37. USFS R&D 2015. Forest Service Research and Development Tribal Engagement Roadmap (No. FS-1043). U.S. Department of Agriculture, Forest Service, Washington, D.C.

38. Vinyeta and Lynn, 2013. Exploring the role of traditional ecological knowledge in climate change initiatives (General Technical Report PNW-GTR-879). U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

39. Whyte 2017. Indigenous Climate Change Studies: Indigenizing Futures, Decolonizing the Anthropocene. English Language Notes, 55(1–2), 153–162.

Recurring themes

Rights-based framing for data and knowledge governance. Many resources treat Indigenous rights and self-determination as the basis for authority over data about Indigenous peoples, lands, and knowledge (UN (2007); FNIGC (2019); Kukutai & Taylor (2016); Rainie et al. (2017)).

Governance across the full data lifecycle (not just access). A common thread is that governance applies from collection and consent through storage, analysis,

publication, and downstream reuse, often implemented through policies, protocols, and agreements (Carroll et al. (2021); Harding et al. (2012); Carroll et al. (2019)).

Collective rights and community-level risk. Several resources emphasize that harms and benefits can be collective (not only individual), affecting how privacy, consent, and benefit-sharing are defined (Carroll et al. (2020); Rainie et al. (2019); Hudson et al. (2020)).

"Open" is conditional and purpose-based. A recurring design goal is to treat openness as conditional on Indigenous-defined purposes, authority, and accountability; this often appears via principles language and/or explicit terms-of-use (GIDA (2026); Carroll et al. (2021); FNIGC (2019); Native-Land.ca (2024)).

Secondary uses have persistent governance concerns. Risks often described include reuse beyond the original intent, linkage with other datasets, and circulation of sensitive information outside the community (Carroll et al. (2020); Rainie et al. (2019); Hudson et al. (2020); Oaster (2024)).

Operational mechanisms for implementation. Across domains, resources point to practical mechanisms such as controlled access, data access committees, tiered permissions, metadata/provenance practices, and repository guidance as ways to implement governance in day-to-day workflows (Carroll et al. (2021); Hudson et al. (2020); Anderson & Christen (2013)).

Traditional and Indigenous knowledge governance as boundary-setting. Multiple resources treat engagement with Indigenous Knowledge and Traditional Ecological Knowledge (TEK) as requiring explicit protocols for access, protection, and decisions about what can be made public (CTKW (2014); Vinyeta & Lynn (2013); Prabhakar et al. (2022); Rinkevich et al. (2011); Rossier & Lake (2014)).

Partnership processes and institutional practice. A consistent theme is that data/knowledge work is shaped by relationship design (consultation, reciprocity,

time, roles, permissions) and by institutional constraints/capacity (USFS R&D (2015); Steen-Adams et al. (2023); Sowerwine et al. (2019); Native Governance Center (2024); Nature United (2020)).

Capacity building and governance infrastructure. Several resources emphasize that Indigenous data governance requires sustained capacity (people, funding, institutions, planning) and that data quality/relevance issues reflect structural constraints rather than only technical gaps (Rainie et al. (2017); Nickerson (2017); Hoagland et al. (2017); Lovett et al. (2018)).

Land and stewardship context shapes what data exist and who can govern them. Resources in land and climate settings highlight how jurisdiction, consultation, and land tenure patterns shape data availability, sensitivity, and governance constraints (Long et al. (2018); Case-Scott & Lynn (2021); ILTF (2024); Whyte (2017); Norton-Smith et al. (2016)).

Areas of contention

Open access norms vs controlled/conditional access. Some resources critique "open by default" assumptions and propose controlled access and Indigenous-defined conditions, while others emphasize technical openness and reuse norms that require adaptation to fit Indigenous governance expectations (Rainie et al. (2019); Hudson et al. (2020); Carroll et al. (2021)).

Individual consent frameworks vs collective consent and community oversight. Several resources argue that standard ethics and consent models centered on individuals do not fully address community-level risks, leading to emphasis on tribal government oversight, community protocols, and collective consent mechanisms (Harding et al. (2012); Hudson et al. (2020); Smith (2012)).

Intellectual property law vs Indigenous cultural authority mechanisms. A recurring tension is between conventional intellectual property tools (e.g., copyright) and Indigenous approaches that communicate responsibilities, provenance, and

community protocols through labels, licenses, or governance agreements (Anderson & Christen (2013); UN (2007); FNIGC (2019)).

Integrating Indigenous knowledge with Western scientific workflows. Resources vary in how they frame integration—ranging from co-production approaches to stronger boundary-setting approaches that treat knowledge sharing as optional and risk-bearing; this affects data practices (what is recorded, stored, published, and disclosed) (Prabhakar et al. (2022); Climate and Traditional Knowledges Workgroup (2014); Vinyeta & Lynn (2013); Eisenberg et al. (2024)).

Public disclosure obligations vs confidentiality for sensitive knowledge. Some resources highlight conflicts between confidentiality needs and legal/administrative processes that can expose sensitive information (e.g., Freedom of Information Act considerations; permitting/consultation records) (Prabhakar et al. (2022); Oaster (2024); Case-Scott & Lynn (2021)).

Metrics and narratives (deficit framing vs Indigenous-defined indicators). Resources describe tensions between externally imposed indicators (often deficit-oriented) and Indigenous-defined measures of wellbeing, relationship quality, and governance priorities (Rainie et al. (2017); Nickerson (2017); Rodriguez-Lonebear (2016)).

Where data are held vs who has authority to govern. Several resources treat Indigenous authority as extending beyond custodial location (state, university, repository, platform), while implementation approaches differ across domains and jurisdictions (Rainie et al. (2019); Kukutai & Taylor (2016); Native-Land.ca (2024)).

Standardization/FAIR alignment vs cultural protocol signaling. There is a practical tension between data standardization for reuse (Findable, Accessible, Interoperable, Reusable (FAIR)) and representing cultural protocols and governance constraints in metadata and repositories, with different proposals for how to bridge these requirements (Carroll et al. (2021); Anderson & Christen (2013)).

Resource clusters

The resources reviewed naturally emerged into several non-exclusive clusters (several resources fit in multiple clusters).

- **Principles and governance frameworks (general)**: CARE, FAIR+CARE operationalization, "good data" practices, and Indigenous data governance strategy inventories.
    - Examples: Carroll et al. (2020); Carroll et al. (2021); Lovett et al. (2018); Carroll et al. (2019); Rainie et al. (2017); Rainie et al. (2019).
- **Rights, policy, and legal anchors**: International rights instruments and policy statements that provide a rights-based basis for authority and obligations in data/knowledge work.
    - Examples: UN (2007); Jewell (2014); FNIGC (2018).
- **Federal/agency guidance and program roadmaps**: Government guidance that translates consultation, trust responsibility, and Indigenous Knowledge considerations into agency practice (often including information-handling and disclosure considerations).
    - Examples: Prabhakar et al. (2022); USFS R&D (2015); Case-Scott & Lynn (2021); Long et al. (2018); Norton-Smith et al. (2016); Vinyeta & Lynn (2013).
- **Protocols and practice guides for working with Indigenous Knowledge / TEK**: Practitioner-facing protocols and "do/don't" guidance focused on access, protection, permissions, and boundary-setting.

    - Examples: CTKW (2014); Rinkevich et al. (2011); Rossier & Lake (2014); Indigenous Knowledge Lab (2024); Native Governance Center (2024); Nature United (2020).

- **Repository, metadata, and platform mechanisms**: Resources focused on how governance is implemented in information systems (labels/licenses, provenance, access conditions, terms-of-use).

    - Examples: Anderson & Christen (2013); GIDA (2026); Native-Land.ca (2024); Carroll et al. (2021).

- **Research ethics, agreements, and oversight mechanisms**: Work focused on consent, community-level risks, institutional review limitations, and formal agreements.

    - Examples: Harding et al. (2012); Hudson et al. (2020); Smith (2012).

- **Open-data / big-data critiques and secondary-use risk**: Resources that focus on open data, linkage, reuse beyond intent, and associated governance requirements.

    - Examples: Rainie et al. (2019); Carroll et al. (2020); Hudson et al. (2020).

- **Climate, stewardship, and land-management applications**: Applied resources in climate adaptation, public-lands stewardship, and ecocultural management where data/knowledge governance shows up through consultation, co-stewardship, and handling of sensitive place-based knowledge.

    - Examples: Whyte (2017); Eisenberg et al. (2024); Norton-Smith et al. (2016); Long et al. (2018); Quaempts et al. (2018); Marks-Block et al. (2021); Case-Scott & Lynn (2021); ILTF (2024).

- **Case studies and empirical examples of governance in practice**: Place- and nation-specific examples (including conflict cases) used to illustrate governance challenges and responses.
    - Examples: Oaster (2024); Rainie et al. (2017) (case studies); Marks-Block et al. (2021); Quaempts et al. (2018); Sowerwine et al. (2019).
- **Capacity building, measurement, and "nation-to-nation" indicators**: Resources emphasizing capacity, infrastructure, and evaluation/indicator frameworks for governance and relationships.
    - Examples: Nickerson (2017); Hoagland et al. (2017); Rainie et al. (2017).

Annotated bibliography

> *Anderson, J., & Christen, K. (2013). 'Chuck a Copyright on it': Dilemmas of Digital Return and the Possibilities for Traditional Knowledge Licenses and Labels. Museum Anthropology Review, 7(1–2), 105–126.*

This article examines a recurring dilemma in "digital return" and repatriation work: Indigenous communities often need better control over digitized cultural heritage materials held by archives/museums, but mainstream intellectual property (IP) tools—especially copyright—are frequently ill-fitting because they assume individual authorship, originality, and time-limited rights that do not map cleanly to Indigenous collective stewardship responsibilities and community protocols. The authors

describe how communities may resort to “chucking a copyright on it” as a pragmatic fallback, even when they would prefer governance frameworks that align with Indigenous laws and cultural obligations.

As a response, Anderson and Christen introduce **Traditional Knowledge (TK) Licenses and Labels** and the **Local Contexts** platform as an alternative, community-oriented “rights and responsibilities” layer intended to communicate provenance, appropriate use, and culturally grounded access/attribution expectations for Indigenous materials circulating in digital systems. The piece bridges legal regimes, repository practice, and metadata-level interventions—showing how “open access” rhetoric can collide with Indigenous governance, and how labeling/licensing patterns can support Indigenous authority without relying solely on state IP law.

- **Core dilemma**: digitization increases access but can amplify third-party use; conventional copyright often cannot encode Indigenous collective governance.
- **TK Licenses and Labels**: proposes a flexible, community-facing way to communicate protocols and permissions for Indigenous cultural materials in digital circulation.
- **Local Contexts as infrastructure**: positions an educational/digital platform to deliver and scale these labels/licenses across institutions and communities.
- **Governance through metadata/protocol signals**: highlights how labels can operationalize provenance, attribution, and use conditions in mainstream catalogs and repositories.
- **Implication for “open”**: reframes ethical access as governed access—aligned with Indigenous rights and responsibilities rather than default openness.

Carroll, S. R., Rodriguez-Lonebear, D., & Martinez, A. (2019). Indigenous Data Governance: Strategies from United States Native Nations. Data Science Journal, 18(1). https://doi.org/10.5334/dsj-2019-031

This research paper argues that **Indigenous Data Sovereignty** (the right of each Native nation to govern the collection, ownership, and application of its data) is exercised through **Indigenous Data Governance** and "decolonizing data," and that reclaiming authority over Indigenous data is essential because data have become a major locus of power in open data, big-data reuse, and data linkage ecosystems. Carroll and colleagues describe "data dependency" in U.S. Native nations as a colonial legacy sustained by a paradox of scarcity/abundance: extensive data are collected *about* Indigenous peoples but rarely *by or for* Indigenous nations' purposes, reinforcing external control, deficit narratives, and mistrust.

The paper inventories and categorizes **governance strategies** already being used by Native nations and allied entities—ranging from tribal policies, codes, and protocols to agreements and stewardship arrangements—while explicitly noting that rebuilding effective Indigenous data systems will require resources, time, and partnerships with other governments and data agents. It also offers definitions for Indigenous data that span demographic statistics, maps of sacred lands, and culturally embedded knowledge, underscoring that governance must cover both digital datasets and knowledge/information that can be digitized.

- **Defines Indigenous Data Sovereignty and Indigenous Data Governance**: frames Indigenous Data Sovereignty as governance of collection/ownership/application, operationalized through Indigenous Data Governance and decolonizing data.
- **Diagnoses "data dependency"**: describes structural conditions (inaccurate/irrelevant data, external ownership/control, mistrust, weak infrastructure/capability, deficit framing) that constrain Native nations.

- **Broad scope of Indigenous data**: includes citizens, lands/resources, and cultural/community information (e.g., sacred-site maps, songs, social media), not just administrative datasets.
- **Strategies and instruments**: highlights governance tools such as policies, protocols, codes, and agreements that reposition authority and clarify stewardship/accountability.
- **Capacity + partnership requirement**: emphasizes that sovereignty-aligned data systems require sustained resourcing and negotiated relationships—not one-off research projects.

Carroll, S.R., Garba, I., Figueroa-Rodríguez, O.L., Holbrook, J., Lovett, R., Materechera, S., Parsons, M., Raseroka, K., Rodriguez-Lonebear, D., Rowe, R., Sara, R., Walker, J.D., Anderson, J., Hudson, M., 2020. The CARE Principles for Indigenous Data Governance. Data Science Journal 19, 43. https://doi.org/10.5334/dsj-2020-043

This practice paper introduces the **CARE Principles for Indigenous Data Governance**—**Collective Benefit, Authority to Control, Responsibility, and Ethics**—developed through the International Indigenous Data Sovereignty Interest Group (Research Data Alliance) in consultation with Indigenous Peoples and partners. The authors position CARE as a response to recurring harms from **secondary use of data** and limited **benefit-sharing**, especially as open data, machine learning, and large-scale data-sharing ecosystems expand.

CARE is presented as a **people- and purpose-oriented** complement to the more data-centric **FAIR** principles. The paper's headline guidance—**"Be FAIR and CARE"**—signals that technical best practices for findability and reuse are not sufficient when data are "on or about" Indigenous Peoples, communities, territories, and knowledges;

governance must also reflect Indigenous rights, responsibilities, and self-determination.

- **Core idea**: data governance should actively enable **collective benefit** and equity, not just downstream reuse.
- **Authority to control**: Indigenous Peoples' rights and interests in Indigenous data require enforceable decision-making power over access, use, and stewardship.
- **Why now**: open science + AI/ML amplify both opportunities and risks via **expanded secondary use**.
- **Implication for open projects**: default "open by design" approaches may need exceptions, layered access, or Indigenous-defined protocols to align with Indigenous governance and ethics expectations.
- **Origin and legitimacy**: CARE is grounded in Indigenous Data Sovereignty movements and is intended for adoption by data stewards and institutions (not only Indigenous communities).

Carroll, S.R., Herczog, E., Hudson, M., Russell, K., Stall, S., 2021. Operationalizing the CARE and FAIR Principles for Indigenous data futures. Sci Data 8, 108. https://doi.org/10.1038/s41597-021-00892-0

This commentary paper focuses on **implementation**: how to make "**Be FAIR and CARE**" actionable in real data infrastructures and workflows. The authors argue that as big/open data and open science expand, Indigenous Peoples' rights to **control**

and access their data remain limited; pairing FAIR with CARE both improves machine actionability and foregrounds people, purpose, and rights **across the data lifecycle**.

Operationalization is framed as a standards-and-tooling challenge as much as an ethics challenge. Drawing on Research Data Alliance (RDA) processes (including the FAIR Data Maturity Model work), the paper highlights that implementing CARE will likely require **criteria, assessment methods, and repository services** analogous to the FAIR ecosystem—while acknowledging that CARE must remain grounded in Indigenous rights and interests. It also points to concrete mechanisms already in use that help bridge CARE+FAIR in practice.

- **Repositories and services**: Earth Science Information Partners work suggests repositories need specific operational services/criteria; a practical insight is that **FAIR documentation can make CARE implementation easier**.
- **Bridging examples**: Indigenous content management (e.g., **Mukurtu**) can be CARE-aligned but may need richer metadata/protocols to be FAIR; New Zealand's Integrated Data Infrastructure protocol **Ngā Tikanga Paihere** is offered as a CARE-consistent access approach that also supports FAIR.
- **Metadata-level tools**: **Traditional Knowledge (TK) Labels** are highlighted as a digital mechanism to restore provenance/relationships and encode community protocols within mainstream catalog/content systems.
- **Scope**: CARE applies not only to "traditional knowledge" but also to **scientific data** derived from Indigenous lands, waters, and people.
- **Bottom line**: open/FAIR should be treated as **"as open as determined by Indigenous communities"**, with explicit governance and ethics mechanisms to minimize harm and maximize collective benefit.

Case-Scott, H., & Lynn, K. (2021). Strengthening the Federal-Tribal Relationship: 25-Year Report on Monitoring Consultation under the Northwest Forest Plan (Northwest Forest Plan: The First 25 Years (1994-2018)). U.S. Forest Service, Pacific Northwest Region. https://www.govinfo.gov/content/pkg/GOVPUB-A13-PURL-gpo188885/pdf/GOVPUB-A13-PURL-gpo188885.pdf

This U.S. Forest Service report reviews and reflects on **25 years of monitoring consultation** under the Northwest Forest Plan, framing consultation as a core component of government-to-government relations and a practical pathway for strengthening the federal–tribal relationship in land management. Case-Scott and Lynn synthesize how consultation has been approached over time, identify persistent challenges (capacity constraints, inconsistent implementation, and institutional barriers), and highlight opportunities to improve consultation quality, accountability, and outcomes for tribes across the Plan area.

Consultation processes often hinge on information exchange about culturally sensitive resources, treaty-reserved rights, and place-based knowledge. The report's emphasis on monitoring and improving consultation implies that agencies need clearer processes for how information is requested, protected, documented, and used—especially when consultation can create pressure to disclose sensitive knowledge without sufficient safeguards or reciprocal benefit.

- **Consultation as a monitored practice**: treats consultation not as a one-time event but as an ongoing process that should be assessed and improved over time.
- **government-to-government context**: links consultation to tribal sovereignty, trust responsibility, and treaty contexts in federal land management.
- **Institutional barriers and capacity**: identifies structural constraints that shape consultation quality (staffing, timelines, continuity, resources).

- **Information sensitivity**: underscores that consultation often involves cultural/sacred resource information that requires careful handling and protection.
- **Action orientation**: offers recommendations intended to improve consultation outcomes and strengthen relationships under NWFP implementation.

Climate and Traditional Knowledges Workgroup. (2014). Guidelines for considering traditional knowledges in climate change initiatives. https://climatetkw.wordpress.com

This self-organized workgroup publication offers practitioner-facing guidance for U.S. tribes, agencies, and organizations on how **Traditional Knowledges (TKs)** can inform climate change initiatives while minimizing risks to tribes and knowledge holders. The work is explicit that the guidelines (and the associated website) are **not a venue to share TKs**; rather, they are intended to help non-tribal partners understand issues of access, protection, and the governance responsibilities that arise when TKs are engaged in climate science, adaptation planning, and agency initiatives.

The resource frames engagement as a sovereignty and consent issue: it emphasizes respect for tribal sovereignty and safeguards through **free, prior and informed consent (FPIC)**, careful consideration of access and protection, and attention to the risks that can follow from sharing knowledge outside the community. In the context of tribal data sovereignty, the guidelines provide a climate-specific operational companion to CARE/OCAP®-style governance framing—translating "why" (rights and authority) into "how" (do's/don'ts, partner behaviors, and boundary-setting).

- **Boundary-setting**: states the guidelines are for understanding TK governance and risks—not for exchanging TKs.
- **Sovereignty + FPIC**: foregrounds tribal sovereignty and consent as prerequisites for engaging TKs in climate initiatives.

- **Access and protection**: emphasizes that climate projects must plan for protection needs and downstream risks when TKs leave the community context.
- **Audience and use**: aimed at agencies and organizations working with tribes in climate adaptation/science contexts.
- **Practical value**: provides a climate-specific "engagement protocol" mindset that complements CARE/OCAP® and Indigenous research protocols.

> *Eisenberg, C., Prichard, S., Hessburg, P.F., Nelson, M.P., 2024. Braiding Indigenous and Western Knowledge for Climate-Adapted Forests: An Ecocultural State of Science Report. The Wise Path Forward.* *https://depts.washington.edu/flame/mature_forests/pdfs/BraidingSweetgrassReport.pdf*

This "ecocultural state of science" report synthesizes **Indigenous Knowledge** and **Western Science**—explicitly framed as a "Two-Eyed Seeing" / "braiding" approach—to guide climate- and wildfire-adaptation strategies for forests across North America. Beyond ecological synthesis, Eisenberg and colleagues place governance and history at the center: they describe how colonization and fire exclusion helped produce today's forest conditions and argue that durable adaptation requires **recognizing and respecting Tribal sovereignty** through government-to-government co-stewardship in planning, monitoring, decision-making, and adaptive stewardship.

The report also connects directly to Tribal data governance: it cites the **CARE Principles** (Carroll et al. (2020)) as complementary guidelines for designing data ecosystems and includes examples that emphasize acting **"in strict keeping with Tribal Data Sovereignty"** when learning where culturally significant plants and animals may occur as climate conditions change.

- **Five recommendations include sovereignty**: one recommendation is to "Recognize and respect Tribal sovereignty and Indigenous Knowledge," paired with establishing and supporting government-to-government co-stewardship partnerships.
- **Data governance link**: references CARE and frames Indigenous Data Governance as relevant to how agencies and partners design and use information in stewardship contexts (Carroll et al. (2020)).
- **Sensitive ecological/cultural information**: highlights the need for protected partnerships and agreements when working with information about culturally significant species/places under climate change.
- **Operational stance**: positions braiding Indigenous Knowledge and Western Science as a practical foundation for climate-adapted forest management (e.g., cultural burning, thinning, monitoring), not just a rhetorical commitment.

First Nations Information Governance Centre. (2018). The First Nations Principles of OCAP®. First Nations Information Governance Centre. First Nations Information Governance Centre. Retrieved February 10, 2019, from https://fnigc.ca/ocap

Archived version (Wayback):
https://web.archive.org/web/20191020235402/https://fnigc.ca/ocap

This First Nations Information Governance Centre (**FNIGC**) webpage defines and explains **OCAP®**—**O**wnership, **C**ontrol, **A**ccess, **P**ossession—as a set of First Nations principles that assert and operationalize First Nations' governance authority over data. OCAP® is framed as both an expression of collective rights (who "owns" information about First Nations peoples/communities) and a practical standard for

how research and other data activities should be conducted so that First Nations have decision-making power over collection, use, access, stewardship, and custody.

This web resource translates rights and sovereignty claims into governance expectations that institutions, researchers, and data stewards can adopt (e.g., formal authority, access rules, custody, and accountability). It also notes that "open" or externally controlled approaches can conflict with Indigenous governance expectations, and that data practice requires defined authority, access rules, and community benefit/accountability—aligned with (but distinct from) CARE/FAIR discussions.

- **Ownership**: asserts collective ownership of information about First Nations peoples/communities.
- **Control**: establishes First Nations authority over all stages of the data lifecycle (creation → analysis → dissemination).
- **Access**: emphasizes First Nations' right to access their data and to decide who else can access it.
- **Possession**: distinguishes ownership from physical custody and stresses the importance of control over where/how data are held.
- **Operational impact**: describes a governance framework that is often embedded in agreements, repository policies, and research protocols.

Global Indigenous Data Alliance. (2026). CARE Principles for Indigenous Data Governance. Global Indigenous Data Alliance. Global Indigenous Data Alliance. Retrieved February 10, 2026, from https://www.gida-global.org/care

This Global Indigenous Data Alliance (**GIDA**) webpage presents the **CARE Principles for Indigenous Data Governance**—a people- and purpose-oriented principles framework developed as an Indigenous-led response to open data and open science movements that "do not fully engage with Indigenous Peoples rights and interests." The page explicitly positions CARE as a complement to FAIR: where FAIR focuses on technical characteristics that increase sharing/reuse, CARE foregrounds collective benefit, Indigenous authority, responsibility, and ethics in contexts shaped by historical power differentials and ongoing risks of misappropriation.

Beyond defining the "#BeFAIRandCARE" framing, the page functions like an implementation hub. It links to the original CARE publication, translated versions, slides, and follow-on publications applying CARE in domains like ecology/biodiversity and genomics. It also documents the Indigenous-led convening process that produced CARE and provides a centralized location for CARE materials, adaptations, and context.

- **CARE as a complement to FAIR**: explicitly critiques "sharing-only" approaches and emphasizes people/purpose alongside technical openness.
- **Rights and value**: highlights Indigenous Peoples' rights/interests in Indigenous data and the right to create value grounded in Indigenous worldviews and self-determination.
- **Implementation hub**: consolidates primary publication, translations, slides, and applied extensions of CARE.
- **Indigenous-led provenance**: documents the workshop/convening origins and acknowledges contributors, supporting legitimacy and citation tracing.
- **Practical implication**: supports "as open as determined by Indigenous communities" as a design constraint for open data infrastructures.

Harding, A., Harper, B., Stone, D., O'Neill, C., Berger, P., Harris, S., Donatuto, J., 2012. Conducting Research with Tribal Communities: Sovereignty, Ethics, and Data-Sharing Issues. Environ Health Perspect 120, 6–10. https://doi.org/10.1289/ehp.1103904

This commentary argues that when conducting research with American Indian tribes, conventional university **institutional review board (IRB)** review is not sufficient because it often fails to account for harms and obligations at the **community/government level**. Harding and colleagues focus on community-based participatory research (**CBPR**) in both health and natural resource settings and emphasize that only tribal nations can identify some adverse outcomes—and can do so only when they are given a clear understanding of the research assumptions, methods, and intended uses of results.

The article highlights sovereignty and intellectual property as central to data governance: tribes should be equal partners in study design, data collection, interpretation, and publication, and research should be governed by explicit agreements that address data ownership/control and downstream reuse. As a practical contribution, the authors present a model **Material and Data-Sharing Agreement (MDSA)** based on a collaboration between the Confederated tribes of the Umatilla Indian Reservation and Oregon State University, intended to meet both tribal and university requirements while incorporating **intellectual property rights** considerations that standard IRB processes may omit.

- **IRB ≠ tribal consent/oversight**: IRB approval may still leave tribes exposed to community-level harms and may not address intellectual property rights or sovereignty.
- **Equal partnership is a governance requirement**: tribes should be partners in design, collection, interpretation, and publication—not just "participants."
- **Data-sharing must be formalized**: recommends written agreements tailored to the tribal–university context to define ownership, control, analysis conditions, and publication expectations.

- **tribal research codes/permissions matter**: notes that some tribes establish research codes and permitting that can condition or disallow research.
- **Capacity and comprehension**: emphasizes extra explanation and/or trained tribal staff to support truly informed consent for complex research and to reduce coercion.

Hoagland, S.J., Miller, R., Waring, K.M., Carroll, O., 2017. Tribal Lands Provide Forest Management Laboratory for Mainstream University Students. Journal of Forestry 115, 484–490. https://doi.org/10.5849/jof.2016-064R1

This brief communication describes a partnership between Northern Arizona University forestry faculty and Bureau of Indian Affairs (BIA) foresters on the Fort Apache Indian Reservation (White Mountain Apache Tribe) to integrate tribal forest management into a graduate silviculture curriculum. The core intervention is a field program that contrasts and co-convenes trips on tribal lands and adjacent national forests so students can see differences in governance context, objectives, and silvicultural practices in "Indian Country," and broaden their understanding beyond dominant forestry paradigms.

The authors frame the program as a response to a recognized gap in forestry education: graduates often have strong technical skills but insufficient preparation in "human dimensions," including cultural competency and cross-cultural communication. Perspectives from students, faculty, and tribal/BIA professionals are used to evaluate the program's value and offer a transferable framework for other institutions.

- **Experiential learning on tribal lands**: uses field trips to expose students to tribal forest management and governance context (including a general

introduction to tribal governance and culturally based values of multiple forest resources).

- **Contrast across land tenures**: pairing tribal and national-forest visits helps students compare objectives, constraints, and management approaches across ownerships.
- **Workforce development**: emphasizes building nontechnical skills (human dimensions, cultural competency, cross-cultural communication) alongside silvicultural knowledge.
- **Mutual benefit framing**: positions the field program as beneficial to students, faculty, and professional foresters, and offers a framework for replication.

Hudson, M., Garrison, N. A., Sterling, R., Caron, N. R., Fox, K., Yracheta, J., Anderson, J., Wilcox, P., Arbour, L., Brown, A., Taualii, M., Kukutai, T., Haring, R., Te Aika, B., Baynam, G. S., Dearden, P. K., Chagné, D., Malhi, R. S., Garba, I., … Carroll, S. R. (2020). Rights, interests and expectations: Indigenous perspectives on unrestricted access to genomic data. Nature Reviews Genetics, 21(6), 377–384. https://doi.org/10.1038/s41576-020-0228-x

This "Perspectives" article argues that blanket norms of **unrestricted/open access** to genomic data are often incompatible with Indigenous rights and interests in genetic resources and associated knowledge, and that equitable benefits from genomics require stronger Indigenous participation in governance and clearer accountability over downstream use. Hudson and colleagues frame Indigenous critiques around **trust, accountability, and equity**, noting long-standing harms from misrepresentation, lack of consultation and informed consent, and misuse of samples/data—including a contemporary example where the U.S. National Institutes of Health "All of Us" program faced tribal consultation failures, prompting a National Congress of American Indians resolution calling for tribal consent and oversight for data/specimens associated with tribal citizens.

The paper proposes actionable principles and practices for “responsible access” to Indigenous genomic data. It emphasizes that institutional ethics review alone is insufficient and often lacks Indigenous representation; that future secondary uses are difficult to anticipate under conventional consent paradigms; and that mechanisms like robust community consultation, dynamic consent, and formal agreements (for collective consent/approval) can better address collective risks and benefit-sharing. It also highlights concrete governance patterns already accepted elsewhere in genomics (e.g., controlled-access repositories and data access committees) as models that could be extended to Indigenous governance expectations, with transparency of provenance and equitable credit as key supports for ongoing relationships and accountability.

- **Core claim**: “open by default” genomic data access can undermine Indigenous governance and rights; governance must be explicit and ongoing.
- **Three principles**: build **trust** (communities decide on public vs. request-based access), enhance **accountability** (transparent provenance/disclosure), and improve **equity** (credit, participation, benefit-sharing).
- **Ethics review is not enough**: argues institutional ethics committees cannot be the sole arbiters and often fail to reflect Indigenous rights/interests.
- **Consent and secondary use**: highlights limits of one-time consent for unknown future uses; discusses dynamic consent and collective consent via agreements.
- **Implementation pathways**: points to controlled-access models (data access committees) and emphasizes transparency, provenance, and equitable benefit distribution.

Indian Land Tenure Foundation, 2024. Land Tenure Issues [WWW Document]. Indian Lands in Indian Hands. URL https://iltf.org/land-issues/issues/ (accessed 10.24.24)

This Indian Land Tenure Foundation (ILTF) webpage provides a concise overview of major, enduring land-tenure challenges rooted in the 1887 General Allotment Act (Dawes Act) and subsequent land alienation. It emphasizes how these historical policies contributed to the loss of approximately 90 million acres of Indian land and created land patterns that continue to constrain tribal self-determination, governance, and economic development.

Two core land-tenure issues highlighted are **checkerboarding** (a mix of trust, fee, tribal, and non-Indian ownership within reservation boundaries) and **fractionated ownership** (undivided interests split across many heirs over generations). The page describes how both issues impede coherent land use and management by making it difficult to assemble contiguous land bases, increasing regulatory/jurisdictional complexity, and raising transaction costs for everyday decisions about land.

- **Checkerboarding**: mixed ownership patterns within reservations impair contiguous land use and complicate access and traditional uses.
- **Jurisdictional complexity**: overlapping county, state, federal, and tribal authorities can create uncertainty and conflict within reservation borders.
- **Fractionated ownership**: growing numbers of owners per parcel make decision-making and productive land use difficult, with minimal individual returns.
- **Why it persists**: the issues are framed as ongoing consequences of allotment and land alienation policies rather than isolated contemporary failures.

Indigenous Knowledge Lab, Algoma University, Indigenous Knowledge Lab, Deakin University, Indigenous Commons, AIME, 2024. Protocols for Non-Indigenous People Working with Indigenous Knowledge. Indigenous Systems Knowledge Collective. *https://drive.google.com/file/d/1SAX5Lh7NNkb3grGw3i863S-_jYkWORXr/view*

This Indigenous Systems Knowledge Collective document offers a set of protocols for **non-Indigenous** people and organizations seeking to work with Indigenous Knowledge. It is explicitly written as a response to "failed projects" and extractive or performative inclusion efforts, and frames protocols as **governance and right relations**—including boundary work, access negotiation, and accountability—rather than as a checklist for "including" Indigenous content.

A central conceptual move is to distinguish protocols between Indigenous groups (described via "embassy" and shared meta-languages across compatible systems) versus protocols at the Indigenous/non-Indigenous interface (likened to a computing protocol for interoperability between incompatible systems, with "firewalls" to protect Indigenous systems). The document offers a "protocol bundle" organized into five phases (Relation, Access, Making, Tension, Accounting) represented through ritual object categories (Container, Ornamentation, Tool, Protective Device, Weapon). It is designated **read-only for non-Indigenous people**, while open-source and alterable for Indigenous groups to adapt to local biocultural contexts.

- **Protocols as governance**: treats protocols as norms/procedures that enable proper governance, boundary-setting, and "right relations," not simply cultural etiquette.
- **Different interface, different rules**: emphasizes that Indigenous/non-Indigenous engagements require distinct access and regulation processes (including protective "firewalls").

- **Five-phase "protocol bundle"**: organizes engagement into Relation, Access, Making, Tension, and Accounting, with ritual-object metaphors to make obligations legible and memorable.
- **Read-only vs adaptable**: instructs that non-Indigenous users should not modify or claim the framework, while encouraging Indigenous groups to adapt it locally.
- **Expectation-setting for change/exit**: explicitly prepares outsiders for projects to be ended, altered, or diverted by communities, and frames "graceful acceptance" as part of accountability.

Jewell, S., 2014. Reaffirmation of the Federal Trust Responsibility to Federally Recognized Indian Tribes and Individual Indian Beneficiaries (Secretarial Order No. 3335). U.S. Department of the Interior, Secretary of the Interior, Washington, D.C. https://www.doi.gov/sites/doi.gov/files/migrated/news/pressreleases/upload/Signed-SO-3335.pdf

This Secretarial Order (SO 3335) reaffirms the U.S. Department of the Interior's **federal trust responsibility** to federally recognized Indian tribes and individual Indian beneficiaries, situating it in constitutional, treaty, statutory, and case-law foundations. It frames the trust responsibility as involving "the highest moral obligations" to protect tribal and individual Indian lands, assets, resources, and treaty and similarly recognized rights, while recognizing that the specific contours and enforceability of fiduciary duties are shaped by federal law.

In response to recommendations from the Secretarial Commission on Indian Trust Administration and Reform, the Order establishes seven guiding principles for all Interior bureaus and offices. These principles emphasize respect for tribal

sovereignty and self-determination, protection of trust and restricted fee lands/resources and treaty rights, responsive communication, partnership, conflict avoidance/resolution, timely collaborative evaluation of requests for affirmative protective action, and seeking legal advice where warranted. The Order also clarifies scope/limitations (guidance only; no creation of enforceable rights; subject to resources).

- **Defines a governance baseline**: articulates trust responsibility as a guiding framework for Interior decision-making affecting tribes and individual Indian beneficiaries.
- **Seven guiding principles**: sovereignty/self-determination; protect trust/restricted fee lands/resources and treaty rights; be responsive/informative; partner on mutually beneficial projects; avoid/resolve conflicts while protecting trust interests; timely collaborative action; seek Solicitor advice when warranted.
- **Implementation posture**: frames empowerment of tribes (self-determination era) and rebuilding trust after breach-of-trust litigation/settlements as part of a "new era of trust."
- **Limits and scope**: specifies the Order is guidance, creates no enforceable rights, and is subject to law and resource availability.

Kukutai, T., & Taylor, J. (2016). Data sovereignty for indigenous peoples: Current practice and future needs. In T. Kukutai & J. Taylor (Eds.), Indigenous Data Sovereignty (1st ed.). ANU Press. https://doi.org/10.22459/CAEPR38.11.2016.01

This agenda-setting chapter introduces Indigenous Data Sovereignty as a rights- and self-determination-oriented response to data regimes that have historically

been dominated by nation-states and corporations. Kukutai and Taylor argue that Indigenous Peoples have inherent rights and interests in data "about their people, lifeways and territories," and that those rights extend beyond jurisdictional debates to the everyday realities of **data consent, use, ownership, and storage**—especially as data become more pervasive and more readily linked and reused.

Crucially, the chapter makes the "operationalization" problem concrete by focusing on the infrastructure of **official statistics** in contexts of Canada, Australia, Aotearoa/New Zealand, United States: census modernization, increased reliance on administrative data, and data integration/linkage initiatives (e.g., New Zealand's Integrated Data Infrastructure). The authors frame UNDRIP as an anchoring international instrument and argue that statistical portrayals of Indigenous "populations" should evolve toward approaches that enable Indigenous "peoples" to exercise identity, participation, and governance over data collection, dissemination, and stewardship, including capacity building for Indigenous-led data compilation and use in self-governance and development planning.

- **Origins and purpose**: synthesizes outcomes of a 2015 workshop convened to develop an Indigenous Data Sovereignty agenda leveraging UNDRIP.
- **Scope and limits**: emphasizes demographic, wellbeing, and community-development data practices (while explicitly bracketing deeper legal/technical/commercial questions for future work).
- **Statistics as governance**: highlights why census transformation, administrative-data use, and data linkage matter for Indigenous representation, control, and accountability.
- **Participation and identity**: argues Indigenous Peoples need meaningful participation in decisions affecting collection, dissemination, and stewardship—not merely being "counted."
- **Implementation challenge**: flags persistent "implementation gaps" where state commitments can fail without Indigenous-defined governance mechanisms.

Long, J., Lake, F.K., Lynn, K., Viles, C., 2018. Chapter 11: Tribal ecocultural resources and engagement, in: Synthesis of Science to Inform Land Management within the Northwest Forest Plan Area (PNW-GTR-966). U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR, pp. 851–917.
https://www.fs.usda.gov/treesearch/pubs/56333

This chapter synthesizes science and policy context on "tribal ecocultural resources" within the Northwest Forest Plan (NWFP) area and provides guidance on engagement approaches that can uphold tribal rights and federal responsibilities while advancing public-land management goals. The authors use "ecocultural" to emphasize inseparability of ecological conditions and cultural relationships, including both material "first foods" and nonmaterial cultural ecosystem services.

The chapter includes a clear overview of the federal–tribal relationship as it bears on public-land management (trust responsibility, treaties and reserved rights, consultation as a cornerstone of government-to-government relations) and responds to a Forest Service guiding question about the capacity of NWFP forests to provide "Native American first foods" and whether active management is warranted. It frames tribal engagement not as optional outreach but as integral to effective restoration and stewardship where federal lands overlap ancestral territories and treaty/off-reservation rights.

- **Defines "tribal ecocultural resources"**: integrates ecological dynamics (fire, hydrology, vegetation, climate change) with tribal cultural values, practices, and reciprocal relationships.

- **Centers "first foods"**: treats traditional foods (e.g., salmon, elk, huckleberry, camas) as a key management question tied to ecological capacity and active stewardship.
- **Federal–tribal relationship basics for managers**: summarizes trust responsibility, treaties/reserved rights, and consultation obligations (including Executive Order 13175) as governing context for decisions affecting tribal trust resources and welfare.
- **Engagement as strategy, not add-on**: argues that distinctive strategies for engaging tribes can support restoration of ecocultural resources while advancing other federal land-management goals.
- **Links management actions to rights and responsibilities**: emphasizes that public-land decisions in the NWFP area profoundly affect tribal access to resources because so much ancestral territory is managed by federal agencies.

Lovett, R., Lee, V., Kukutai, T., Cormack, D., Rainie, S. C., & Walker, J. (2018). Good Data Practices for Indigenous Data Sovereignty and Governance. In A. Daly, S. K. Devitt, & M. Mann (Eds.), Good Data (pp. 26–36). Institute of Network Cultures.

This book chapter frames **"good data"** as an Indigenous-led response to historically poor and extractive data practices embedded in official statistics, research, and policy systems. Lovett and colleagues define **Indigenous Data Sovereignty** and **Indigenous Data Governance**, situate their emergence in colonial uses of data for surveillance/statecraft, and argue that at the heart of Indigenous Data

Sovereignty/Indigenous Data Governance is Indigenous peoples' and nations' right to decide what data development occurs and to set controls over the **collection, governance, ownership, and application** of data about their peoples, territories, lifeways, and natural resources—grounded in Indigenous sovereignty and supported by instruments such as UNDRIP.

The chapter connects principles to implementation contexts: it discusses how "good data practices" apply across the lifecycle (from conceptualizing data items and ethics processes through analysis, reporting, and policy translation), and it highlights governance models and movements, including OCAP® and multiple country-specific Indigenous Data Sovereignty networks. It also uses the Havasupai case as an example of harmful secondary use to illustrate why governance, consent, and accountability mechanisms must be explicit rather than assumed.

- **Defines Indigenous Data Sovereignty and Indigenous Data Governance**: clarifies sovereignty (rights/interests) vs. governance (power/authority over design, ownership, access, and use).
- **Colonial statistics context**: treats the census and official data as tools of statecraft that have produced harms and mistrust when applied to Indigenous peoples.
- **Lifecycle framing**: emphasizes governance from data conceptualization and ethics through collection, analysis, reporting, and policy translation.
- **Implementation exemplars**: highlights OCAP® and Indigenous Data Sovereignty networks as concrete institutional pathways toward "good data."
- **Secondary-use risk**: uses the Havasupai case to illustrate why consent and limits on reuse are central to legitimate practice.

Marks-Block, T., Lake, F.K., Bliege Bird, R., Curran, L.M., 2021. Revitalized Karuk and Yurok cultural burning to enhance California hazelnut for

basketweaving in northwestern California, USA. fire ecol 17, 6.
https://doi.org/10.1186/s42408-021-00092-6

This open-access study evaluates Karuk and Yurok cultural burning as a form of socio-ecological stewardship that enhances California hazelnut (Corylus cornuta var. californica) basketry stem production for basketweaving in northwestern California. The authors monitor hazelnut stem production, stem qualities, and shrub density across 48 plots spanning prescribed burns and cultural burn sites, analyzing how burn frequency/season and site conditions (e.g., overstory basal area, ungulate browse) relate to basketry outcomes. They also observe gathering practices to compare travel distances, gathering rates, and basketweaver preferences across different fire histories and land tenure contexts.

The results quantify a strong post-burn response: shrubs one growing season after burning produced far more basketry stems than shrubs several seasons post-burn, and frequent cultural fire regimes (on the order of a few years) were associated with higher shrub densities. The paper frames these outcomes as "positive human ecosystem engineering," arguing that strengthening tribal sovereignty over fire management can simultaneously improve socio-economic well-being (e.g., gathering efficiency and reduced travel costs) and support measures of ecosystem structure and function.

- **Cultural burning increases basketry materials**: reports a large increase in basketry stem production in the first growing season after burning compared with longer-unburned shrubs.
- **Mechanisms/constraints**: finds negative relationships between basketry stem production/length and overstory tree basal area and ungulate browse.
- **Burn frequency matters**: higher-frequency burn histories are associated with greater hazelnut shrub density and improved basketry stem outcomes.
- **Gathering efficiency as an outcome**: compares travel and gathering rates across culturally burned, wildfire, and fire-excluded sites, emphasizing practical livelihood impacts.

- **Governance link**: explicitly connects ecological outcomes to land tenure and "increasing tribal sovereignty over fire management."

Native Governance Center, 2024. Partnering with Native Nations in a Good Way. Native Governance Center, Minneapolis, MN. *https://nativegov.org/wp-content/uploads/2024/03/Resource-Partnering-with-Native-Nations-in-a-Good-Way.pdf*

This guide is written for non-Native allies and provides guidance for partnering with Native nations "in a good way." It calls for partnership to affirm Tribal sovereignty, including the demonstration of respect for elected leadership, and taking new approaches ground with an awareness of a long history of harm and distrust caused by extractive or performative "community engagement."

The resource focuses on concrete behaviors and process design: doing upfront research (leaders, points of contact, priorities, and whether efforts are duplicative), approaching with humility and patience, working at the "speed of the community," and respecting protocol and reciprocity. It emphasizes obtaining **permission/approval** through appropriate channels (including not bypassing implementation-side leadership or "usurping the chain of command") and avoiding common pitfalls like unpaid emotional labor demands, optical allyship, and rushed reputational engagements.

- **Meaningful partnership = sovereignty in practice**: respect formal titles, elected leadership, and nation-specific engagement processes.
- **Preparation and due diligence**: research leadership, points of contact, priorities, alignment, and prior/ongoing efforts to avoid duplication and harm.
- **Protocol and approval**: seek permission first (not forgiveness), follow appropriate channels, and allow time for official approval before work begins.

- **Mindset requirements**: humility, openness, patience, and an asset-based mentality that assumes solutions already exist within communities.
- **Avoid common harms**: reduce burdensome emotional labor requests and resist optical allyship/performativity that does not shift power or practice.

Native-Land.ca. 2024. Data Sovereignty Treaty | Native Land Digital API. (Accessed October 11, 2024). https://api-docs.native-land.ca/data-sovereignty-treaty

This web resource ("Native Land Digital: Indigenous Data Sovereignty Treaty") functions as a **terms-of-use governance document** for the Native Land Digital application programming interface (**API**): it frames Native Land Digital as an Indigenous-led nonprofit stewarding culturally sensitive Indigenous community data and sets explicit **permitted uses**, **prohibited uses**, **attribution expectations**, and **enforcement/termination** provisions. Importantly, it defines "Indigenous data" broadly as information originating from or pertaining to Indigenous peoples and their environments regardless of current ownership/source, and it emphasizes Indigenous data as having inherent rights and responsibilities that require maintaining Indigenous authority and integrity.

The treaty operationalizes Indigenous Data Sovereignty in platform terms by restricting commercialization, boundary alteration without consultation/approval, and storage/distribution without explicit permission; it also articulates "Principles and

Actions" emphasizing Indigenous governance, legal jurisdiction (priority to Indigenous laws/customs), and Indigenous-generated territorial data as Indigenous property. It explicitly aligns management with **OCAP®** (Ownership, Control, Access, Possession) principles as a concrete governance framework for data stewardship.

- **Permitted vs. prohibited uses**: allows educational/research and Indigenous-led/non-commercial uses; prohibits monetization, resale, misrepresentation, and unapproved alteration of boundaries.
- **Permissioned redistribution**: prohibits storing or distributing API data without explicit permission from Native Land Digital.
- **Attribution + recognition**: requires attribution to Native Land Digital and acknowledgement of Indigenous communities as rightful stewards.
- **Enforcement lever**: reserves the right to revoke API access and pursue legal action to protect Indigenous Data Sovereignty.
- **OCAP® as implementation frame**: translates Indigenous Data Sovereignty into actionable stewardship commitments (ownership/control/access/possession).

Nature United, 2020. Overview: Our Approach to Working in Partnership with Indigenous Peoples.
https://www.natureunited.ca/content/dam/tnc/nature/en/documents/canada/Overview-Approach-to-Working-with-Indigenous-Partners.pdf

This brief overview describes Nature United's approach to partnering with Indigenous peoples in Canada to support Indigenous-led conservation. It frames its work as evolving practice grounded in humility and accountability, and argues that increasing Indigenous authority to steward lands and waters supports long-term outcomes for both communities and ecosystems. The document situates this

approach in a “rights-based” conservation framing and in reconciliation commitments, while emphasizing that Indigenous-led conservation is defined and implemented by Indigenous communities based on their values, perspectives, and legal frameworks.

The resource provides practical partnership principles and a relationship-building rubric (partner-centered relationships, co-creation aligned with community priorities, respect for diversity within communities, reciprocity/mutual learning, clear communication/accountability, and flexibility/adaptability). It also outlines organizational commitments (team learning/cultural safety, policy/practice development, outreach/education) and four core focus areas that Nature United believes enable Indigenous communities to assert authority in stewardship: strengthening governance, enhancing stewardship capacity, building/sustaining leadership, and supporting local sustainable economies.

- **Rights-based, Indigenous-led framing**: treats respect for Indigenous rights and the further realization of those rights as a conservation practice baseline.
- **Six partnership characteristics**: partner-centered trust; co-creation; community diversity & engagement; reciprocity & mutual learning; clear communication & accountability; flexibility & adaptability (including not rushing to arbitrary deadlines).
- **Organizational commitments**: emphasizes internal cultural competency and policy/practice changes (e.g., training, partnership agreements, communication guidelines) alongside external partnership work.
- **Four enabling elements**: strengthen governance, enhance stewardship capacity, build and sustain leadership, and support local sustainable economies as interconnected conditions for Indigenous-led conservation success.

Nickerson, M. (2017). First Nations' Data Governance: Measuring the Nation-to-Nation Relationship (48 pp.) [Discussion Paper]. Prepared for the British Columbia First Nations' Data Governance Initiative. https://static1.squarespace.com/static/558c624de4b0574c94d62a61/t/618c60f2abd843215add85cf/1636589811532/NATION-TO-NATION_FN_DATA_GOVERNANCE_-_FINAL_-_EN.pdf

This discussion paper is a practice-oriented guide for how the Canadian federal government and First Nations might **define and measure** progress toward a genuine **nation-to-nation** relationship through the lens of **data governance**. Prepared for the British Columbia First Nations' Data Governance Initiative, Nickerson argues that Indigenous nations are actively engaged in nation (re)building and community development, and that federal reporting should shift from program-centric metrics toward indicators that reflect relationship quality, enable nation rebuilding, and support Indigenous wellbeing on Indigenous terms.

The paper connects "data sovereignty" to governance infrastructure: it frames **OCAP®** and First Nations' inherent right to data self-governance as central, emphasizes information-management capacity, and calls for fewer but more meaningful indicators (including qualitative/descriptive where appropriate). It also highlights that many existing statistical frameworks primarily serve government requirements rather than Indigenous development agendas, and that a measurable nation-to-nation relationship should include indicators of culture/language, stewardship, shared decision-making and revenue sharing, and whether consultation/accommodation/consent commitments are being met.

- **Relationship indicators**: proposes shifting measurement from "deficit statistics" toward indicators that capture nation-to-nation relationship quality and enabling conditions for nation rebuilding.
- **Wellness-based indicators**: emphasizes Indigenous-defined wellbeing measures rather than narrow chronic-condition/administrative reporting.

- **OCAP® as governance baseline**: positions Ownership/Control/Access/Possession as foundational to First Nations data self-governance.
- **Capacity and infrastructure**: highlights information-management capacity and access to relevant datasets as practical prerequisites.
- **Policy implication**: argues for coordinated, multi-year support (e.g., comprehensive community planning) and reciprocal data-sharing arrangements aligned with First Nations priorities.

Norton-Smith, K., Lynn, K., Chief, K., Cozzetto, K., Donatuto, J., Hiza Redsteer, M., Kruger, L. E., Maldonado, J., Viles, C., & Whyte, K. P. (2016). Climate change and indigenous peoples: A synthesis of current impacts and experiences (General Technical Report PNW-GTR-944). U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. https://doi.org/10.2737/PNW-GTR-944

This U.S. Forest Service general technical report synthesizes literature on how climate change is affecting Indigenous Peoples in the United States and affiliated territories, with impacts explicitly framed across **sovereignty/self-determination, culture/cultural identity, community health, and economies**. It is both a synthesis of observed/anticipated impacts (e.g., public and mental health, food security and traditional foods, water resources, terrestrial ecosystems, infrastructure, displacement) and a guide to "pathways" for adaptation and mitigation, including a focus on Indigenous community health indicators and the role of traditional knowledge in climate planning.

Climate information is considered as a governance domain rather than a neutral technical input: it foregrounds how climate impacts and responses intersect with treaty rights and tribal decision-making authority. The report emphasizes that

Indigenous knowledge systems and community-defined indicators are needed to avoid one-size-fits-all metrics. It also identifies barriers/limitations and "solutions and best practices" that can inform agency–tribal climate initiatives, including attention to consultation, risk, and appropriate knowledge sharing in collaborative work.

- **Framework**: centers tribal sovereignty/self-determination, culture, and Indigenous community health indicators as core lenses for climate impacts and responses.
- **Comprehensive impacts**: synthesizes climate-related effects on health, food/traditional foods, water, ecosystems, infrastructure, disasters, displacement, and economies.
- **Knowledge systems**: emphasizes traditional knowledge as part of climate understanding and adaptation strategies (with attention to appropriate use and governance).
- **Policy/program relevance**: intended to inform national climate assessments and support tribal and agency climate initiatives and policy development.
- **Best practices + gaps**: identifies barriers and research gaps alongside solutions and "best practices" for designing climate data/knowledge workflows.

> *Oaster, B. "Toastie," 2024. In green energy boom, one federal agency made the Yakama Nation an offer they had to refuse. High Country News 56 (7). https://www.hcn.org/issues/56-7/how-federal-rules-and-a-lack-of-protection-for-sacred-indigenous-sites-left-the-yakama-nation-with-an-impossible-choice/*

This investigative news article uses the proposed Goldendale pumped-hydro energy storage project as a case study of how federal permitting and consultation

processes can pressure tribes to disclose **confidential cultural and ceremonial knowledge** to defend sacred places. Oaster reports that when the Yakama Nation learned in 2017 of plans to tunnel through Pushpum—a privately owned ridgeline within the Nation's ancestral territory overlooking the Columbia River—the Nation sought to stop the project, citing treaty-protected gathering rights and the site's sacred significance.

A central governance tension described is that the Federal Energy Regulatory Commission conditioned meaningful consultation on the Nation providing sensitive, specific information about why the place is sacred—information that, if disclosed, could increase risks of looting, desecration, and other harms. The article thus illustrates a practical "CARE problem" in environmental data and decision-making: Indigenous communities may be asked to trade away **data confidentiality** and cultural safety in exchange for procedural participation, even when the underlying purpose of consultation is to protect treaty rights and cultural resources.

- **Consultation as a disclosure trap**: tribes may be forced to reveal details that make them more vulnerable, with no guaranteed protection or benefit.
- **Culturally sensitive location/heritage data**: information about foods, medicines, archaeological sites, and ceremonial practices can be exploited once shared outside the community.
- **Relevance to data governance**: the case underscores why "as open as determined by Indigenous communities" must extend beyond research datasets to **permitting records, cultural resource documentation, and environmental review workflows**.

Prabhakar, A., Mallory, B., Castille, D., 2022. Guidance for Federal Departments and Agencies on Indigenous Knowledge.

https://www.whitehouse.gov/wp-content/uploads/2022/12/OSTP-CEQ-IK-Guidance.pdf

This White House Office of Science and Technology Policy and Council on Environmental Quality guidance memo provides government-wide direction for federal agencies to recognize and, as appropriate, apply **Indigenous Knowledge** in decision-making, research, and policy—grounded in consultation and collaboration with Tribal nations and Indigenous Peoples. It frames Indigenous Knowledge as a valid and heterogeneous system of knowledge developed through long-term place-based experience and ethical foundations, and emphasizes that Indigenous Knowledge and Western scientific methodologies can be complementary "lines of evidence" that improve outcomes without requiring one to validate the other.

The memo is also explicitly procedural: it identifies promising practices for agencies to collaborate with Tribal nations and Indigenous Peoples, respect decisions to engage or decline on their terms, and build agency capacity so inclusion of Indigenous Knowledge is not dependent on individual staff initiative. It includes planning guidance that is directly relevant to data governance, including foreseeing sensitive/sacred knowledge, identifying mechanisms to address privacy and resource-protection concerns, and consulting agency counsel about Freedom of Information Act and other public-disclosure obligations when handling Indigenous Knowledge.

- **Defines Indigenous Knowledge and its evidentiary role**: treats Indigenous Knowledge as evidence appropriate for federal work and outlines commonalities with scientific methods (systematic observation, verification, adaptation over time).
- **Engagement expectations**: emphasizes early and sustained consultation/collaboration, and respecting Tribes' decisions to participate or decline.

- **Co-stewardship/co-management and co-production**: highlights shared governance structures and knowledge co-production as pathways that can reduce power imbalances and confidentiality risks.
- **Sensitive/sacred knowledge and public disclosure**: directs agencies to plan for privacy/resource-protection concerns and understand public disclosure implications when Indigenous Knowledge is shared.
- **Institutionalization**: encourages agencies to develop plans, timelines, staffing, and training so Indigenous Knowledge inclusion becomes consistent rather than ad hoc.

Quaempts, E.J., Jones, K.L., O'Daniel, S.J., Beechie, T.J., Poole, G.C., 2018. Aligning environmental management with ecosystem resilience: a First Foods example from the Confederated Tribes of the Umatilla Indian Reservation, Oregon, USA. E&S 23, art29. https://doi.org/10.5751/ES-10080-230229

This "Insight" article presents the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) "First Foods" management approach as a practical framework for aligning environmental management with ecosystem resilience. It centers **reciprocity**—grounded in CTUIR creation belief and ceremonial serving order—as a moral and practical organizing principle that connects human obligations to care for the foods, waters, and ecosystems that sustain people. The authors describe how this reciprocity-based lens helped CTUIR environmental programs shift goals and planning over a decade toward resilient and functional river ecosystems that support culturally significant foods.

The paper explicitly treats "First Foods" (e.g., fish/salmon, big game, roots, berries, and water) as both ecological and governance objects: they are served and

honored in an ordered ritual that also encodes spatial distribution and linkages to treaty rights (Walla Walla Treaty of 1855), informing intergovernmental relationships and collaborative management outside the reservation. The authors argue this approach can help other resource managers communicate, plan, and act in ways that benefit both human and nonhuman communities while navigating interagency contexts and climate-driven change.

- **Reciprocity as a management principle**: frames resilience work as reciprocal obligations between people and other biota, not just service extraction.
- **First Foods as an organizing framework**: uses culturally significant foods (and water) to structure program mission, priorities, and ecological objectives.
- **Governance linkage**: connects the serving order and "First Foods" concept to treaty-reserved rights and intergovernmental collaboration across ceded/aboriginal use areas.
- **Resilience orientation**: emphasizes managing dynamic ecosystems for long-term function rather than simplifying systems for short-term productivity.
- **Practical communication/planning value**: positions the framework as a way to align values, goals, and restoration actions across diverse stakeholders.

Rainie, S. C., Schultz, J. L., Briggs, E., Riggs, P., & Palmanteer-Holder, N. L. (2017). Data as a Strategic Resource: Self-determination, Governance, and the Data Challenge for Indigenous Nations in the United States. The International Indigenous Policy Journal, 8(2). https://doi.org/10.18584/iipj.2017.8.2.1

This article argues that data are a **strategic resource** for tribal self-determination and governance, but that the prevailing "data landscape" for Indigenous nations in the United States is characterized by sparse, inconsistent, and often **tribally irrelevant** information largely produced and controlled by external governments

and researchers. The authors frame this as a governance problem: reliance on data that do not reflect tribal needs, priorities, and self-conceptions can directly undermine tribal decision-making and therefore threaten self-determination.

The paper makes these challenges concrete by identifying five recurring problems in Indigenous population data (inconsistency, irrelevance, poor quality, mistrust, and external control) and by presenting two case studies—**Ysleta del Sur Pueblo** and the **Cheyenne River Sioux Tribe**—that pursued tribal data sovereignty through locally governed demographic and socioeconomic data initiatives. Across both cases, the emphasis is on building community-relevant measures, strengthening internal capacity, and using data both internally (services, needs, lands/resources) and externally (policy influence, resource management, funding) on tribally defined terms.

- **Five-problem diagnostic**: Indigenous population data are often inconsistent, irrelevant, poor quality, produced/used in mistrust contexts, and externally controlled.
- **Governance framing**: positions tribal data sovereignty as a long-overdue shift toward tribal governance of data about Indigenous populations.
- **Case studies**: describes tribal-led demographic/socioeconomic data initiatives (Ysleta del Sur Pueblo; Cheyenne River Sioux Tribe) oriented toward local relevance and decision-making.
- **Internal + external use**: highlights why tribes need data for governance (service delivery, monitoring, resource stewardship) and for influencing external policy/funding systems.
- **Implications**: calls attention to policy and institutional changes needed to support tribal authority, participation, and capacity in data systems.

Rainie, S. C., Kukutai, T., Walter, M., Figueroa-Rodríguez, O. L., Walker, J., & Axelsson, P. (2019). Indigenous Data Sovereignty. In T. Davies, M. Rubinstein, & F. Perini (Eds.), The State of Open Data: Histories and Horizons (1st ed., pp. 300–319). African Minds. https://doi.org/10.47622/9781928331957

This book chapter (in *The State of Open Data*) argues that Indigenous data sovereignty is a direct challenge to dominant assumptions in open data ecosystems—especially binaries like "open vs. closed," a single nation-state "data owner," and narrow conceptions of data as purely digital/quantitative. The authors define Indigenous data sovereignty as Indigenous Peoples' right to govern the collection, ownership, and application of data about Indigenous peoples, lands, and resources **regardless of where data are held**, and they emphasize both individual and **collective** rights (including collective privacy and confidentiality).

The chapter links Indigenous data sovereignty to concrete open data failure modes (licensing/appropriation, data linkage without Indigenous governance, low investment in Indigenous data capacity and infrastructure) and outlines practical directions: selecting stewardship and governance mechanisms aligned with Indigenous rights/aspirations, improving quality/access/value of Indigenous data, and investing in capacity (skills, connectivity, funding). It also situates Indigenous data sovereignty in global rights frameworks and standards (e.g., UNDRIP participation and self-determination provisions; Sustainable Development Goals (SDGs) data disaggregation on Indigenous terms) while noting that implementation mechanisms and legal strategies for Indigenous data governance are still emerging.

- **Open data as "double-edged sword"**: highlights simultaneous opportunity (development aligned with Indigenous aspirations) and risk (appropriation, bias, colonial power dynamics).
- **Collective rights matter**: foregrounds collective governance over data linkage/sharing/use, including collective privacy/confidentiality.

- **Beyond "digital-only" data**: treats Indigenous data sovereignty as also protecting knowledge/information that can be digitized and decontextualized by outsiders.
- **Implementation levers**: emphasizes governance/stewardship mechanisms plus investment in Indigenous data capacity and infrastructure.
- **Standards alignment**: connects Indigenous data sovereignty to UNDRIP and SDG-related data practices, implying open data principles should explicitly incorporate Indigenous rights.

Rinkevich, S., Greenwood, K., Leonetti, C., 2011. Traditional Ecological Knowledge for Application by Service Scientists (Fact Sheet). U.S. Fish & Wildlife Service, Native American Program, Arlington, VA. *https://www.fws.gov/sites/default/files/documents/TEK-Fact-Sheet.pdf*

This U.S. Fish & Wildlife Service fact sheet provides a working definition of Traditional Ecological Knowledge (TEK) and offers practical guidance for "service scientists" on documenting and applying TEK in wildlife conservation, research, and monitoring. It frames TEK as place-based, evolving knowledge developed through long-term relationships with the environment and transmitted culturally, encompassing ecological observations as well as worldviews and relationships among human and non-human beings.

The document emphasizes that TEK use is not new and can be complementary with Western scientific approaches. It highlights applied examples (e.g., oil spill restoration, threatened species listing) and provides an overview of social-science methods for documenting TEK (e.g., literature review, semi-directive interviews, focus groups, participant observation, linguistics), including an explicit instruction that **permission from the Indigenous government should be received prior to beginning**

a research project. It also underscores that TEK collection yields more information than any single project needs and that respectful retention/curation (often by tribal institutions) matters.

- **Working definition + scope**: defines TEK as long-term, place-based knowledge and practice including relationships, timing, lifeways, and worldview.
- **Complementarity**: treats TEK and Western science as potentially complementary, with TEK informing conservation biology and management decisions.
- **Permission and respect**: explicitly directs researchers to obtain permission from the Indigenous government before starting TEK-related research.
- **Methods matter**: outlines concrete documentation approaches drawn from ethnography and related social-science methods.
- **Partnership framing**: positions TEK as one avenue for honoring trust responsibility and building mutually beneficial relationships when resources are of mutual interest.

> *Rodriguez-Lonebear, D. (2016). Building a data revolution in Indian country. In T. Kukutai & J. Taylor (Eds.), Indigenous Data Sovereignty (1st ed.). ANU Press. https://doi.org/10.22459/CAEPR38.11.2016.14*

This chapter argues that Indigenous nations' "data revolution" is both overdue and necessary: although the broader data age has produced an explosion of information, Indigenous peoples continue to face **data inequities** and a "paucity of data" about their own populations—particularly when most existing population data are generated and controlled by external governments for external purposes. Rodriguez-Lonebear frames this as a sovereignty and decolonization issue, tracing a

shift from Indigenous peoples as long-standing data gatherers (e.g., winter counts, totem poles, oral histories as durable information systems) toward **data dependence** under U.S. colonization, exclusion from official statistics, and assimilation-era policy regimes.

As a practical contribution, the chapter synthesizes recurring problems with American Indian population data (e.g., limited availability, methodological instability, political nature of counting/representation) and highlights emerging tribal efforts to reclaim **tribal data sovereignty** as a tool for nation building and development planning. The chapter's case illustrations (e.g., Ishi repatriation efforts as reclaiming control over Indigenous "data," census exclusion history, and contemporary tribal choices shaped by Indigenous knowledge) underline that data governance includes both conventional statistical datasets and culturally embedded knowledge systems.

- **Data are political**: emphasizes that "counting" and official statistics shape representation and power, and historically excluded many American Indians from enumeration.
- **From sovereignty to dependence**: traces how removal/assimilation policies disrupted Indigenous knowledge systems and pushed tribes toward reliance on external data.
- **Indigenous data systems**: provides concrete examples of Indigenous data and information stewardship (winter counts, totem poles, oral histories) as longstanding "science" and governance infrastructure.
- **Reclaiming tribal data sovereignty**: frames the emerging "data revolution in Indian Country" as a decolonization and development tool for tribes.
- **Broad governance scope**: illustrates why data governance must cover both population statistics and knowledge/information that can be taken, digitized, and reused.

Rossier, C., Lake, F., 2014. Indigenous Traditional Ecological Knowledge in Agroforestry (Agroforestry Note No. 44). USDA National Agroforestry Center, Lincoln, NE. https://research.fs.usda.gov/treesearch/47452

This USDA National Agroforestry Center note introduces how Indigenous Traditional Ecological Knowledge (TEK) informs agroforestry—both historically (longstanding Indigenous management of bioculturally diverse ecosystems) and in contemporary practice as land managers seek more complex, multi-objective stewardship under changing conditions. It provides accessible definitions of agroforestry and TEK, explains why many Indigenous communities' ancestral homelands have been altered or removed from traditional management, and argues that Indigenous practices and adaptive knowledge can inform climate adaptation strategies and diversified, native-plant-based agroforestry systems.

The note is also explicit about governance and knowledge stewardship: it cautions that some knowledge is sacred or treated as intellectual property belonging to a particular Indigenous group, that people have a right not to share, and that any sharing requires clear mutual understanding about what may be published or disseminated. It calls out patterns of extractive research (take information/data, publish, leave) and stresses acknowledgement, reciprocity, and meeting community expectations when TEK is shared.

- **Definitions with practical framing**: connects TEK to place-based stewardship practices (burning, pruning, sowing, tillage) that sustain multiple products and cultural functions.
- **Changed landscape context**: highlights how political boundaries, laws, and land tenure changes disrupted traditional management for many communities.
- **Knowledge stewardship**: emphasizes rights not to share, sacred knowledge, and the risk of decontextualization; recommends clarity about what can be made public.

- **Reciprocity and acknowledgement**: stresses crediting knowledge holders and ensuring tangible/intellectual "give back," not extractive publication.
- **Applied examples**: provides examples of Indigenous groups using TEK in agroforestry contexts (e.g., basketry materials, syrup, restoration partnerships).

Smith, L. T. (2012). Decolonizing Methodologies: Research and Indigenous Peoples. Zed Books.

This foundational book argues that "research" has often functioned as an instrument of imperialism and colonization—producing knowledge *about* Indigenous peoples in ways that legitimate unequal power relations, extract value, and shape policy while marginalizing Indigenous knowledge systems and priorities. Smith situates these harms historically (e.g., disciplines and institutions that "research through imperial eyes") and calls for Indigenous peoples to "research back," developing counter-practices oriented toward accountability to Indigenous communities and self-determination.

The book provides a framing for why governance mechanisms are often treated as requirements for tribal data sovereignty: if knowledge production has been tied to dispossession and misrepresentation, then Indigenous-led control over research agendas, methods, interpretation, and dissemination (including what is collected, what is shared, and for whose benefit) becomes a governance issue. While not a "data governance toolkit," Smith's framing is consistent with governance approaches such as Indigenous research protocols/codes, community consent and oversight, reciprocity, and shifting from deficit-oriented measurement to Indigenous-defined priorities and wellbeing.

- **Research as a site of power**: frames Western research as historically entwined with imperialism, representation, and policy control.
- **"Research back"**: argues for Indigenous-led agendas and methods that disrupt extractive norms and center community benefit and accountability.
- **Ethics beyond IRB**: emphasizes relational/community obligations and culturally grounded protocols, not just institutional compliance.
- **Knowledge governance implication**: supports Indigenous authority over collection, interpretation, dissemination, and reuse—core to data sovereignty practice.
- **Anti-deficit orientation**: encourages shifting away from problem-framing and toward Indigenous-defined priorities, strengths, and futures.

Sowerwine, J., Sarna-Wojcicki, D., Mucioki, M., Hillman, L., Lake, F., Friedman, E., 2019. Enhancing Food Sovereignty: A Five-year Collaborative Tribal-University Research and Extension Project in California and Oregon. Journal of Agriculture, Food Systems, and Community Development 9, 167–190. https://doi.org/10.5304/jafscd.2019.09B.013

This article describes a five-year, federally funded tribal–university research and extension partnership in the Klamath River Basin (southern Oregon / northern California) designed to improve tribal health, food security, and **Indigenous food sovereignty** by building a healthy, sustainable, culturally relevant food system. Using a community-based participatory research (CBPR) approach, the authors describe how goals and activities were co-created with three tribes and local partners, and reflect on partnership-building in a context shaped by historical disenfranchisement, limited access to ancestral lands, institutional power asymmetries, and gaps in knowledge caused by assimilation and historical trauma.

The paper discusses the process of developing **tribal research protocols** and **intellectual property (IP)** rights documents, as well as institutional infrastructure (e.g., tribal herbaria, food security library, curriculum) intended to support long-term community control, continuity, and use of knowledge. It also provides a menu of project components (research, education, extension/workshops, youth camps, workforce development via the Píkyav Field Institute) as examples of how to translate partnership principles into practice.

- **CBPR partnership architecture**: outlines how a multi-organization, multi-Tribe partnership co-created goals, objectives, and activities over time.
- **From "food security" to Indigenous food sovereignty**: frames project motivation in Indigenous food sovereignty (reconnection to land-based food and political systems; responsibilities to lands/plants/animals) even while using food security metrics to interface with national programs.
- **Protocols and IP governance**: highlights development of tribal research protocols and IP rights documents as key mechanisms to avoid extractive research and support tribal priorities.
- **Applied capacity-building**: documents extension and education approaches (curriculum, workshops, seasonal camps) plus infrastructure (tribal herbaria) and workforce development (Píkyav Field Institute).
- **Lessons learned**: offers reflections for researchers, extension advisors, nonprofits, and agencies on building and sustaining effective partnerships with tribes for food system change.

Steen-Adams, M.M., Lake, F.K., Jr..Jones, C.E., Kruger, L.E., 2023. Partnering in research about land management with tribal nations— insights from the Pacific West. Gen. Tech. Rep. PSW-GTR-275. Albany, CA: U.S. Department

of Agriculture, Forest Service, Pacific Southwest Research Station 275.
https://doi.org/10.2737/PSW-GTR-275

This U.S. Department of Agriculture (USDA) Forest Service general technical report synthesizes literature and field-based insights on **effective practices for research partnerships** between the Forest Service and tribal nations in land-management contexts (forests, fuels, climate adaptation, and ecocultural resources) across the Pacific West. It is explicitly practice-oriented: the authors organize effective partnership practices into three categories—**institutional context-adapted** (legal/policy foundations, consultation, governance structures), **tribal social context-adapted** (culture, history, traditional knowledge systems, appropriate methods), and **relationship-adapted** (early/continuous engagement, obtaining consent, and sometimes repairing relationships).

The authors assert information work is inseparable from governance and relationship work. They frame partnership-building as a **multistage life cycle** and emphasizes that "legacy effects" (community memory of past interactions) shape present and future collaboration conditions—affecting how agencies handle expectations, sensitive information, data-sharing, and "give back" obligations in research design, implementation, and dissemination.

- **Seven-stage partnership life cycle**: identify shared goals/concerns; learn tribal governance; coordinate natural and social science frameworks; forge partnership instruments; adapt methods to tribal context; conduct research/management action; and **give back**.
- **Partnership models**: describes government, collaborative, and community partnership types to match goals and contexts.
- **Governance in practice**: highlights consultation, consent, and formal partnership instruments as practical mechanisms for accountability and durable collaboration.

- **Sensitive knowledge and information flows**: notes the need to align methods and information handling with cultural context and community priorities (including confidentiality/sensitivity where relevant).
- **Actionable audience**: written for scientists and land managers (and applicable to universities and nongovernmental organizations) who need concrete guidance to build and maintain productive partnerships.

> *United Nations General Assembly. (2007). United Nations Declaration on the Rights of Indigenous Peoples (UN Doc. A/RES/61/295). United Nations. https://www.un.org/development/desa/Indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf*

This United Nations General Assembly declaration is a foundational international rights instrument that affirms Indigenous Peoples' collective and individual rights, including rights to self-determination, culture, lands/territories/resources, participation in decision-making, and free, prior and informed consent (FPIC). For tribal data sovereignty and Indigenous data governance, the most directly relevant provisions are those that establish Indigenous Peoples' authority over cultural heritage and knowledge systems and that require states to recognize and protect those rights.

In particular, **Article 31** states that Indigenous Peoples have the right to **maintain, control, protect, and develop** their cultural heritage, **traditional knowledge**, and traditional cultural expressions, including "sciences, technologies and cultures," and to maintain/control/protect/develop their **intellectual property** over those materials. This provides a rights-based basis for why data and knowledge "on or about" Indigenous Peoples—especially culturally sensitive information—should not default to open/public dissemination without Indigenous governance, and why institutions

should build enforceable mechanisms for Indigenous authority, consent, and stewardship.

- **Rights basis for governance**: establishes an international framework supporting Indigenous authority over cultural heritage and knowledge-related materials.
- **Article 31 as a direct hook**: explicitly affirms rights to control/protect/develop traditional knowledge and intellectual property—relevant for metadata, repositories, and secondary use.
- **FPIC**: includes free, prior and informed consent expectations that matter for data collection, access, and reuse in research and policy contexts.
- **State obligations**: calls for effective measures (with Indigenous Peoples) to recognize and protect these rights, implying institutional responsibilities beyond ethics statements.
- **Practical implication**: strengthens the case for "as open as determined by Indigenous communities" and for governance rules around sensitive cultural/location/ecological knowledge.

Forest Service Research and Development Tribal Engagement Roadmap (No. FS-1043), 2015. U.S. Department of Agriculture, Forest Service, Washington, D.C. https://www.fs.usda.gov/research/docs/tribal-engagement/consultation/roadmap.pdf

This roadmap is a programmatic guide for how the U.S. Department of Agriculture (USDA) Forest Service Research & Development (USFS R&D) can build more ethical,

effective, and durable **government-to-government** research and stewardship relationships with federally recognized tribes. It grounds the work in **federal trust responsibility**, **tribal sovereignty**, and consultation obligations, and then translates that framing into six concrete objectives and example actions (partnerships, institutional practices, incorporation of Traditional Ecological Knowledge (TEK), coordination, participatory research, and tool/technology delivery).

The roadmap frames "knowledge and information" work as part of relationship and process design (e.g., transparency, culturally appropriate engagement, and attention to tribal concerns about what may be shared). It also includes an Objective 6 focused on developing decision-support tools for tribal decision-makers and improving access to scientific literature.

- **Operationalizes engagement**: defines objectives/actions for partnerships, participatory research, and institutionalizing trust responsibilities within USFS R&D.
- **Tool delivery for tribal decision-making**: highlights web-based decision-support tools (e.g., disturbance monitoring and climate adaptation planning tools) and training as core engagement activities.
- **Sensitive methodologies**: calls for methods "sensitive to tribal concerns" and incorporating TEK into management tools where possible.
- **Access and capacity**: treats improving tribal access to research results/journals and clear scientist points-of-contact as part of equitable engagement.

Vinyeta, K., & Lynn, Kathy. (2013). Exploring the role of traditional ecological knowledge in climate change initiatives (General Technical Report PNW-GTR-879). U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. https://doi.org/10.2737/PNW-GTR-879

This U.S. Forest Service general technical report synthesizes literature on how **Traditional Ecological Knowledge (TEK)** can inform climate change assessment and adaptation, and it explicitly addresses the benefits and challenges of bringing TEK and Western science together in climate initiatives. Vinyeta and Lynn frame TEK as a primary Indigenous knowledge system for understanding relationships among species, ecosystems, and processes, and argue that TEK can contribute to detecting environmental change, developing adaptation strategies, and informing sustainable land-management principles—while also requiring careful governance to protect Indigenous knowledge systems and cultural integrity.

TEK inclusion is described as more than a purely technical integration problem. The report discusses **policy and administrative mechanisms** that can facilitate or impede TEK inclusion, and it provides considerations on **knowledge exchange**, continued involvement/communication, funding/compensation, and the **protection of TEK** (including sensitivity of knowledge and the need for appropriate protocols). It also offers examples of tribes incorporating TEK into climate research, education, and resource planning, and highlights how tribal–federal partnerships shape inclusion practices.

- **Role of TEK**: identifies TEK contributions to climate assessment, adaptation planning, and land-management practices.
- **Two ways of knowing**: discusses challenges/benefits of working across TEK and Western science without collapsing one into the other.
- **Protection and sensitivity**: emphasizes the need to protect TEK and Indigenous knowledge systems through appropriate protocols and attention to sensitive information.

- **Policy/administrative considerations**: reviews mechanisms that facilitate or challenge TEK inclusion in climate initiatives.
- **Applied examples**: highlights tribal efforts integrating TEK into research, education, and planning, often through tribal–federal partnerships.

Whyte, K. (2017). Indigenous Climate Change Studies: Indigenizing Futures, Decolonizing the Anthropocene. English Language Notes, 55(1–2), 153–162. https://doi.org/10.1215/00138282-55.1-2.153

This essay articulates "Indigenous climate change studies" as a field grounded in Indigenous peoples' histories, knowledge systems, and experiences of colonial disruption, arguing that anthropogenic climate change should be understood as an **intensification of colonialism** and colonially induced environmental change. Whyte emphasizes that many Indigenous communities have deep experience adapting to environmental variability, but that colonial capitalism/industrialization and imposed infrastructure and governance constraints have amplified vulnerability and constrained adaptive options—making climate impacts inseparable from sovereignty, displacement, and justice.

Whyte proposes several key themes that matter for how climate initiatives handle knowledge and data: renewing Indigenous knowledges (including TEK) can strengthen Indigenous self-determined planning; Indigenous peoples imagine climate futures from collective histories of organization and adaptation while also reckoning with ongoing colonial disruptions; and climate governance that treats Indigenous communities as just "stakeholders" obscures nationhood, treaty contexts, and the need for Indigenous-led decision-making. For Tribal data sovereignty, the paper helps reframe climate information work as political and relational—requiring

consent, accountability, and Indigenous authority over how climate knowledge is gathered, interpreted, and mobilized.

- **Climate change as intensified colonialism**: frames climate impacts as continuous with past and present colonial environmental change and dispossession.
- **Indigenizing futures**: argues Indigenous futurity and collective histories guide present climate actions and governance choices.
- **Knowledge renewal**: positions TEK and Indigenous knowledge systems as strengthening self-determined planning rather than as "inputs" to validate Western science.
- **Governance implication**: cautions against stakeholder framings and calls for Indigenous nationhood and sovereignty to shape climate decision-making.
- **Data/knowledge ethics**: supports climate initiatives that recognize colonial power dynamics and therefore require consent, accountability, and relationship-building in knowledge use.